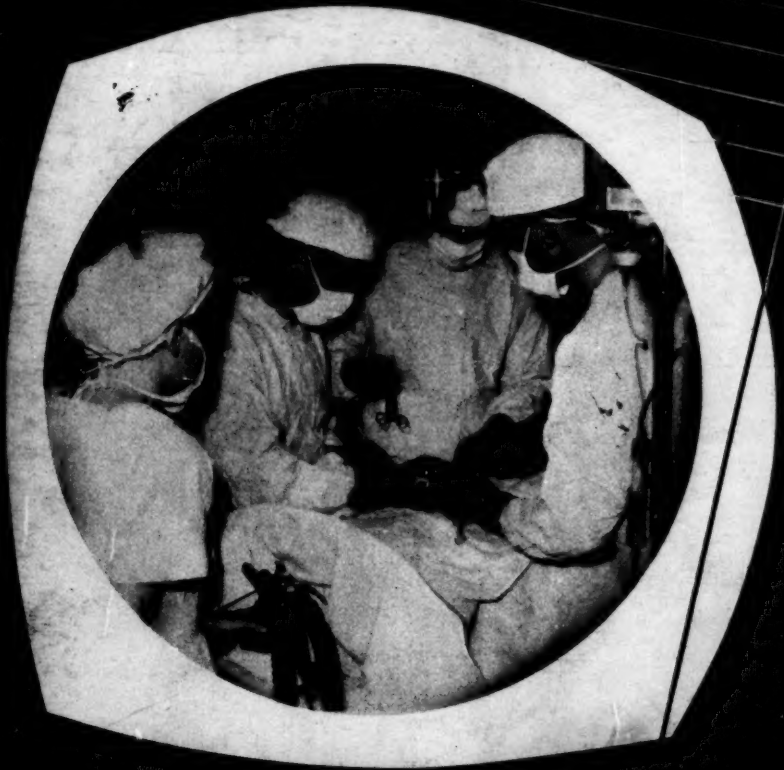
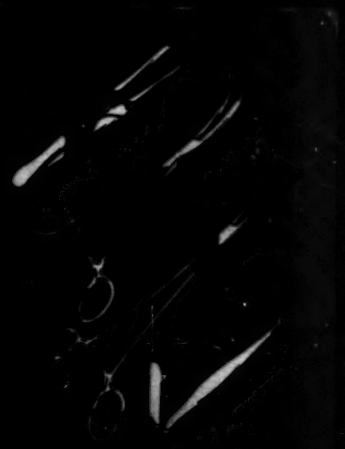
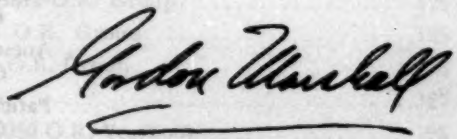




YEARBOOK
from
HOSPITAL TOPICS
volume two

Foreword

Hospital Topics in December 1949 began publishing a section devoted to the interests of the operating room supervisor and her associates. Our aim has been to mirror the activities of the many monthly discussion groups of O. R. supervisors now meeting around the country and disseminating information on new developments in surgical practice and apparatus. Ethicon Suture Laboratories, Inc. has financially sponsored the O. R. Section and made gifts of several thousand subscriptions to individual supervisors. The staff of Hospital Topics independently selects and prepares all material for the O. R. Section. The mention of any product in this section does not constitute an endorsement or recommendation. The puplisher acknowledges the guidance of Carl W. Walter, M.D. and Dorothy Wysocki, R.N., both of the surgical staff of the Peter Bent Brigham Hospital. I take this opportunity to gratefully acknowledge all contributions and the splendid cooperation of all the O. R. Groups. We hope this second Yearbook proves as useful as the first one. Suggestions and contributions to the O. R. Section are always most welcome.



Gordon Marshall
Publisher

Copyrighted, 1952 by Hospital Topics

Table of Contents

Aseptic Technics
Carl Walter, M.D. 4

Role of the O.R. Nurse in Cardiac Surgery
Kathleen W. Phillips, R.N. 12

Outline of Course in O.R. Technic
Sister Magdalen Rosaire 21

Question Box 25

Program Suggestions for A.O.R.N. Meetings 26

Principles and Practice of Operating Room Nursing
Leone De Lelys, R.N. 27

Observational Technics in Evaluation of Students 35

Surgical Notes 37

Sterilizing Cut Length Textiles
O. L. Strain, O.R.S. 38

Anesthesiology Today
Charles S. Coakley, M.D. 40

Patient Safety in the Operating Room
Carl Walter, M.D. 46

The Vertical Drape
Esther Jewett, R.N. ... 57
Reactions to Transfusions During an Operation
Thomas H. Seldon ... 67
Question Box ... 74
Suture Material and Their Uses
I. Mims Gage, M.D. and Champ Lyons, M.D. ... 76
Emergency Treatment of Cardiac Arrest in Surgery
Robert M. Hosler, M.D. ... 82
Care of Electrosurgical Units ... 84
How to Clean Syringes ... 86
Anesthesia for Heart Surgery
Olive T. Berger, R.N. ... 88
Polyethylene Plate for Craniplasty
Eben Alexander, Jr., M.D.
and *Peter H. Dillard, M.D.* ... 90
Surgical Notes ... 93
Medical-Legal Problems in the O.R.
George A. Smith ... 96
Question Box ... 100
Reports from Tri-State Assembly ... 101
Surgical Notes ... 104
International College of Surgeons Meeting ... 107
American College of Surgeons ... 111
Question Box ... 116
O.R. Nurse in Korea
Ruth Boyer Scott, R.N. ... 117
St. Louis O.R. Group ... 119
Reno O.R. Group ... 120
Pittsburgh O.R. Group ... 121
Reception Held for St. Louis O.R. Group ... 122
West Virginia O.R. Group ... 124
Columbus O.R. Group ... 125
San Diego O.R. Group ... 126
O.R. Map ... 127
Index to 1950 O.R. Yearbook ... 128

Dr. Walter in the operating room of Wesley Memorial Hospital, Chicago, lecturing before a class in hospital administration, Northwestern University.

ASEPTIC TECHNICS

By

Carl Walter M.D.

THERE is only one reason for asepsis—prompt kindly wound healing in the individual patient. Accordingly, attention is justifiably directed to the patient's wound as the functional focus of the operating room. That portion of asepsis dealing with the exclusion of bacteria from the surgical wound is possible only because of a complex routine in which the design and the structure of the hospital; the quality of its equipment, including proper installation and maintenance; and intelligent application of the structure and equipment are essential elements.

The sterile field about the wound, along with the anaesthetist and his equipment, presents a field spread over a floor area 10 feet square. The nature of the work done in the sterile area makes it mandatory that there be free access to all sides. A clear corridor four feet wide is necessary along the sterile sides, and one six feet is essential at the anaesthetist's end. Size and shape, therefore, are basic factors in protecting the sterile field from contact contamination. The minimal safe area in which aseptic technique can be accomplished is 18 feet wide and 20 feet long. There is no difference in asepsis for emergency or minor surgery. Every operating room should be of adequate size to assure safety for the patient.

To make this room most useful, access must be limited to double acting doors opening from the corridor at the 18 foot end and a 30 inch swinging door connecting the adjoining sterilizing room near the center of one 20 foot side. There should be no doors in the operating room which encourage the use of the room as a traffic lane to gain access to other areas.

The supplies used to set up an aseptic field must be stored in a vermin free place where there is no chance for contamination due to condensate dripping from cold pipes or ducts. Ideally each operating room is provided with a storage cabinet to accommodate all the sterile supplies necessary for a day's work. Another cabinet of shelves provides space for unsterile equipment and supplies. Among the latter are the jars containing suture material or ampoules submerged in germicide. This germicide must have a low specific gravity so that ampoules and tubes submerge. Both its liquid and vapor phases should be sporicidal so that the inside of the cover and the portions of the jar or transfer forceps which are not immersed are disinfected. It should be a fat solvent to remove greasy fingerprints and water repellent films. The only germicides which accomplish this contain formaldehyde and alcohol. One formula is:

Paper presented at the American College of Surgeons, Boston, by Dr. Walter, associate professor in surgery, Harvard Medical School, associate in surgery, Peter Bent Brigham Hospital, Boston, and author of "Aseptic Treatment of Wounds."

Isopropyl alcohol 99%	700	cc.
Formalin USP 38%	25	cc.
Sodium nitrite	1.0	gm.
Sodium bicarbonate	1.0	gm.
Distilled water qs. ad	1000	cc.

The bacteria which contribute to airborne contamination of the sterile field come from five sources:

(1) Dust and dirt on the operating room floor. The transfer of bacteria from the operating room floor to the field is so rapid that it can properly be said that the operating room floor is a part of every aseptic field. Surgical technique should be elaborated to protect the floor from contamination by pus or blood containing dangerous organisms. Adequate suction to remove pus from the wound quickly to prevent soiling the floor is a necescity. Sponges and suture ends must not be discarded to the floor. The floor should be cleaned daily by a vacuum cleaner which discharges to the outside. It should be mopped after every operation with a sanitizing detergent such as 0.5% Kleneg or 1-1000 sodium hypochlorite. The kind of floor itself is important in that it should have a smooth, non-absorptive surface. Porous, spawling, cracking floors are difficult to clean. Adequate storage spaces contiguous to each pair of operating rooms plays a role in asepsis usually ignored in design. The safe operating room is an empty room which can be cleaned. A room cluttered with superfluous equipment is usually dirty.

(2) Bacteria in ventilating air can be controlled by cleaning the air thoroughly by the use of a Cottrell precipitator. The clean air can then be disinfected by high intensity ultraviolet radiation. Humidified air contributes to the control of airborne bacteria by accelerating the rate of settling-out of bacteria in the air. Aerosols can be dispersed to increase this die-away. None of them are effective unless there is a humidity of more than 50%. Only one leaves no residue and is non-toxic. Triethylene glycol dispersed in a concentration of 1-20 billion has proven satisfactory in experimental installations but cannot be said to be practicable at the present time.

(3) Another source of airborne bacteria is the discharge from the respiratory passages of personnel. When it is realized that laughing, coughing, sneezing and sighing contribute heavily to the number of bacteria in the expired air, it will be realized that control of these activities is essential. Masking helps to suppress gross contamination. At best, the mask is but an averaging device and must be used with the following rules in mind:

a. New masks should be laundered before use to increase their filtering efficiency.
b. Masks should be changed as often as possible. Their effectiveness decreases rapidly after they have been worn several minutes.
c. Masks should fit the face snugly so that the air is forced to filter through the mask.
d. For maximum efficiency, forced expiration should be avoided. Talking, sighing, laughing, sneezing, coughing, all deposit bacteria on the masks, which subsequently contaminate the air expired during normal breathing.
e. Because masks are relatively ineffectual, anyone with upper respiratory infection is grossly negligent when

he enters an operating room. The fact that those with strongly positive nasal cultures expelled hundreds to thousands more hemolytic streptococci than individuals with negative cultures is evidence compelling surgeons to keep "colds" out of the operating room.

(4) The fourth source of airborne bacteria is clothing and bedding. Here the change from street and hospital clothing to clean freshly laundered operating room clothes is essential. Proper treatment of the hospital linen by a final rinse in 20% watery emulsion of white oil or a permanent sanitizing agent minimizes bacteria and contamination during mechanical agitation such as bed making.

(5) Occasional sources of airborne bacteria are dressings, plaster casts, dandruff and hair clippings. Good operating room management demands that soiled dressings and casts be removed before they come to the operating room. The fresh hair cut needs shampooing before it is safe over the aseptic field.

It is interesting that many have the concept that the walls and ceiling must be washed to preserve asepsis. Bacteria do not fly; they are carried by the personnel or spread by carelessness. The walls and ceiling need cleaning only for esthetic reasons. The floor, on the other hand, needs repeated cleaning because contamination is inevitable and heavy and the slightest activity increases airborne contamination.

Air conditioning contributes to aseptic technic when it checks excessive perspiration thus eliminating skin bacteria which ooze through the gown or drop onto the field as beads of perspiration which drip from the moist brow or nose.

Supplies for the sterile field are of three sorts: textiles, solutions, and instruments. Textiles and solutions are best prepared and sterilized in the Central Supply Room where a division of labor can be exploited to advantage. Carefully selected lay technicians, trained in the details of proper packaging and wrapping of supplies or the preparation of solutions, accept their assignments as a challenge and build a career in a field, too often looked upon as menial by nurses. Administrative responsibility for this operation is great. It entails establishment of a strong technique committee so that standardization of supplies is effected; rigid specification so that proper supplies are purchased; careful planning so that adequate quantities are available at all times; active supervision of maintenance of sterilizers so that this vital equipment is reliable.

Supplies can be packaged so that a uniform sterilizing period can be enforced. This puts an end to confusion in the operation of sterilizers. Thirty minutes continuous exposure to saturated steam at 121° C. suffices. This deteriorates properly prepared textiles but little. Automatic controls for the operation of steam sterilizers are available. These should be non-adjustable both as to time and temperature to insure safety for the patient. In a well designed Central Supply Room these controls can be mounted on the supervisor's desk so that she is responsible for the actual operation of the sterilizer.

Sterile solutions can be made by a simple technic in any hospital where major surgery is performed. A prop-

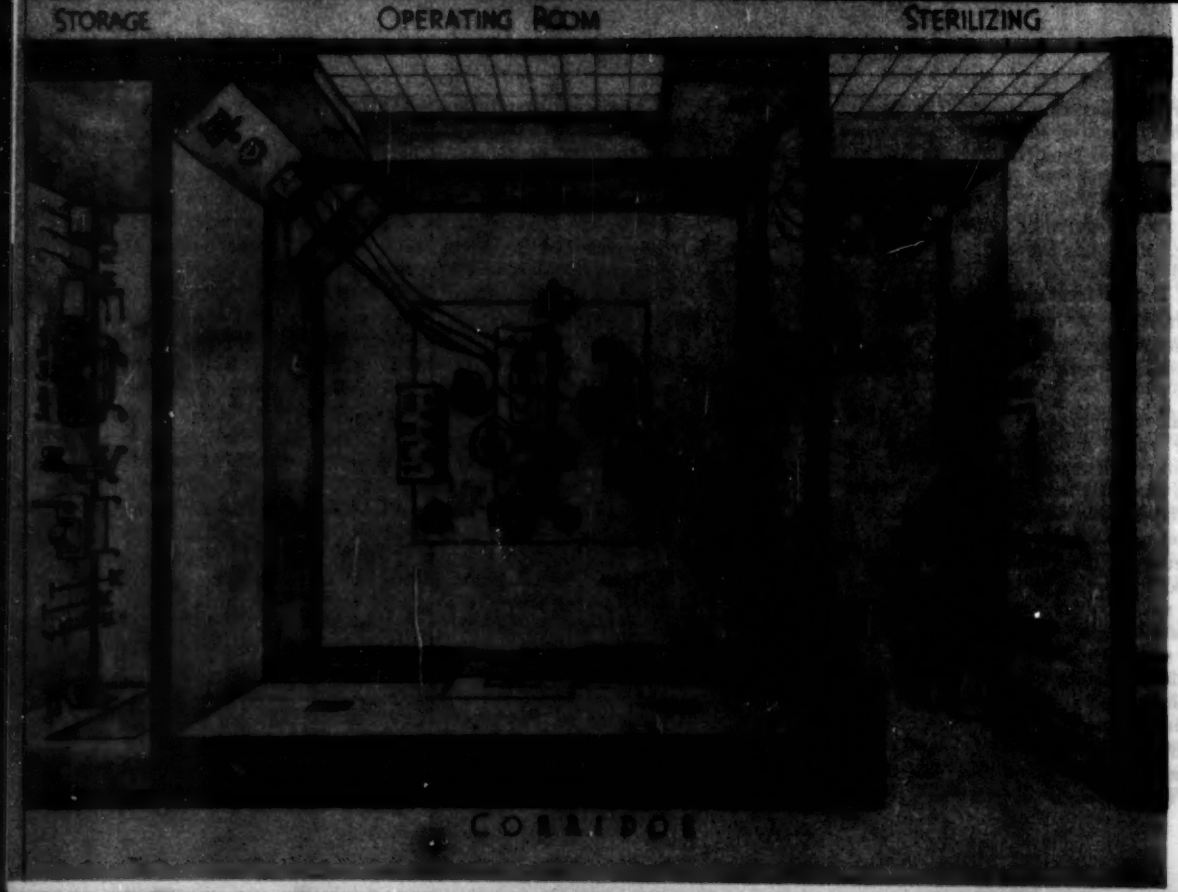


Figure 1

erly installed still with water pressure regulated at 7 p.s.i. and an automatically controlled source of heat provides safe distilled water. The technics for making up divers solutions are not complicated. The solutions can be made up in containers, the proper closure applied, and sterilization accomplished with a hermetic seal in place so that they can be stored indefinitely until used. Solutions for use in the sterile field are ideally sterilized in flasks using the type of closure that provides for a sterile lip. Novocaine solution is a problem in many hospitals. This too can be made up inexpensively in the Central Supply Room using 0.001 N HC1 as the solvent. This is bottled in Pyrex "Boston rounds" sterilized along with the other flasks at 121° C. for 30 minutes. It can be stored indefinitely.

Instruments present several problems in the operating room.

(1) Preoperative sterilization must be so rapid that there is no stimulus for circumventing the technique. It should be effective in the presence of oil, grease, or dirty instruments.

(2) Terminal sterilization is essential at the end of the operation whenever pus or gangrene are encountered. This process should clean blood, pus, grease and feces from instruments while they are being sterilized so that they can be reused immediately or stored without danger.

The instrument washer sterilizer accomplishes both purposes.

(3) The problem of emergency sterilization of instruments suddenly needed by a change in the surgical problem or because an instrument has been dropped to the floor arises many times daily. An emergency sterilizer capable of returning an instrument to the operating field in four minutes is a necessity in the operating room.

(4) Cutting edge instruments are best sterilized by dry heat because this avoids the corrosive action of moist heat on the minute saw teeth of the sharp cutting edge. A small dry heat sterilizer thus becomes an essential part of the sterilizing room.

The modern sterilizing room is designed as indicated, figure 1. This saves many footsteps and keeps the circulating nurse within sight of the operating room. The installation of wash sinks at the far end forces the surgeon to pass through the sterilizing area daily where he is exposed to its problems and gradually his dormant interest is rearoused in a responsibility usually forgotten in a room designed so that he seldom enters except by chance. Modern ventilation and acoustic treatment along with improved sterilizer design has taken the noise and heat out of the sterilizing room so that a surgeon is not uncomfortable while he prepares his hands in that room. The ceiling of the room should be treated with pressed cork because of its acoustic properties. It also prevents condensation of steam which otherwise drips onto sterile instruments when the sterilizers are open.

Modern technics for skin disinfection using synthetic detergents and hexachlorophene make the surgical scrub brief, nine brush strokes to every area of the skin sufficing for the surgeon who scrubs daily. Disinfection of the skin has undergone revolutionary changes. The concept

of mechanical cleansing to remove transient bacteria had been firmly established since 1938. Since 1945 the demonstration that hexachlorophene applied daily will suppress bacteria to the vanishing point makes it possible to save much time and improve technic. Those who have not learned an anatomic scrub, or those who do not scrub daily still present a problem, however. When daily scrubbing is not carried out, the bacterial flora of the skin re-establishes itself during the course of four or five days. The longer the interval between scrubs, the greater the individual problem of disinfecting that particular skin. Hence, it is important to teach surgeons to use 15 strokes if they scrub at weekly intervals, or 30 strokes if they have traumatized their skin by gardening, changing a tire, or have not scrubbed for two weeks. Few individuals can be relied upon to develop an anatomic scrub, so it is wise to provide an arm soak in the scrub room where arms can be immersed in 1-1000 aqueous Zephiran for two minutes.

A technic for the terminal sterilization of the potentially contamined textiles and instruments used in septic cases is essential. This is built around the scrub nurse who, with the aid of a properly designed truck, can dispose of all equipment in 15-20 minutes leaving the area ready for immediate use.

In a discussion on airborne contamination, it was mentioned that the operating room must be isolated from the rest of the hospital to prevent bacteria on hospital and street clothing from gaining access to the operating room. This is accomplished most readily by proper design of the operating suite. Such design forces everyone who enters the operating room to go through an interchange area where provisions are made for changing to clean cotton clothing and conductive shoes. It is not enough to ask surgeons and nurses to change their clothing. There must be provisions for the orderly, x-ray technician, pathologist, and visitors. The pathologist is, perhaps, the most important offender in that his clothing and shoes are usually heavily contaminated, and he is a frequent visitor to both the autopsy room and operating room. Patients should be filtered through the interchange area by means of a recovery room technic where they are removed from their beds and placed on the operating table. Dressings and casts can be removed in this area to avoid contamination of the operating room.

Interchange storage areas are significant in eliminating airborne contamination in that they provide access to those who deliver laundry, anesthesia supplies, housekeeping supplies, etc. Those who work in the operating room can obtain these items from the clean corridor side.

The interchange area also provides two additional functions of asepsis: one is access to an incinerator where expendable waste from operations can be disposed of; the other is a means of disposing of soiled linen from contaminated cases. In some hospitals this may be simply access to a soiled linen chute. In others, this may be a sterilizer where it can be rendered harmless before being sent to the laundry. In small hospitals a home type modified Frigidaire Laundromat can be installed to solve this problem. In large hospitals a combined washer and extractor can be installed to bleach out blood prior to laun-

dering and disinfecting them. It then extracts them so that they can be send as damp wash to the laundry for further finishing.

Note that the technic of surgeons and nurses has not been mentioned in this discussion of asepsis. Emphasis has been placed on the role of the institution in asepsis and its vital function in prompt kindly wound healing.

The most ideal operating room, however, is only the stage. The therapy that benefits the patient results from the action of the surgical team. Aseptic technic is a behavior pattern that insures the success of that surgical technic. It deserves the interest, cooperation and daily support of surgeons, for without aseptic technic, the whole field of elective surgery would collapse.

New Product

Autoclave Type Plastic Sheeting. Can be repeatedly autoclaved for 60 minutes at 18 pounds pressure. Not stained by blood or grease, not affected by acids. Soft, pliable, noiseless. Flame retardant. Available in 36 and 48 inch widths and in rolls of 30, 50, and 100 yards. Can be sewn on standard sewing machine with 7 to 10 stitches per inch. For mattress protectors, pillow covers, anywhere in surgery where autoclaving is required, nursery, etc. Saniglastic, Inc.

Role of the O. R. Nurse in Cardiac Surgery

By Kathleen W. Phillips, R.N.*

THE ROLE of the operating room nurse in the surgical treatment of cardiac abnormalities is an important one which, to the writer's knowledge, has not been presented. The object of this article is to present some practical information on this subject and to help instigate, if possible, an exchange of views on this and other subjects which may result in improved organization and cooperation of operating room nurses, a field which Miss Edythe Alexander has opened so admirably.

Co-ordinated team work is essential in handling all phases of the operation in a calm and efficient manner. The wise surgeon includes his nurse in practicing the necessary steps in the experimental laboratory. He thus reduces her errors during the first few surgical procedures and allows her to contribute suggestions towards better dexterity of the team.

The field of cardiac abnormalities covers a wide variety of malformations. There are many fairly common deformities, but in addition there are many rare types. In this article the corrections of the more common types of defect, which have met with considerable surgical success, will be discussed. These three include: patent ductus arteriosus, tetralogy of Fallot, and coaretation of the aorta.

When a child is born, the patent ductus arteriosus is no longer necessary for life. However, occasionally it fails to become obliterated and surgical treatment is necessary. (Fig. 1) After the diagnosis has been established, surgical considerations are made as to type of procedure.

Tetralogy of Fallot is characterized by pulmonary stenosis, defect of the interventricular septum, aorta overriding the septal defect, and hypertrophy of the right ventricle. (Fig. 2) Two technics are now available in the treatment of tetralogy of Fallot. The Blalock and Taussig[2] method of directing blood to the lungs is by an anastomosis between the pulmonary artery and one of the aortic branches, such as: left subclavian, left common

---

*Miss Phillips is a graduate of the Presbyterian Hospital, Chicago, School of Nursing. She has been the operating room supervisor at Children's Memorial Hospital, Chicago and VA Hospital, Tucson, Ariz. At the present time she is a student at the University of Minnesota. *This article was reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the author are the result of her own study and do not necessarily reflect the opinion or policy of the Veterans Administration.*

carotid or the innominate. The Potts[3] method is a direct anastomosis between the aorta itself and the pulmonary artery.

Coarctation of the aorta is a narrowing or complete stenosis of the aorta. (Fig. 3) In the infant type the stenosis is found in the aortic arch. In the adult type the narrowing appears just at or beyond the origin of the left subclavian artery. Gross[4] describes the operation in which the stenotic segment of the aorta is removed and reconstruction performed. An end-to-end anastomosis is sometimes possible due to the elasticity of the aorta. Cardiac failure does not occur because the stenosis is below the subclavian artery and the blood is already being carried by the vessels arising from aortic arch.

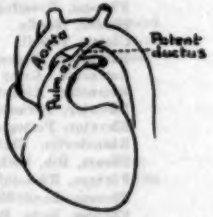


Fig. 1
Patent Ductus Arteriosus

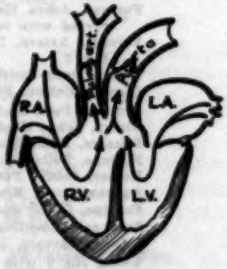


Fig. 2
Tetralogy of Fallot

Prior to the surgery the operating room supervisor must give ample thought to:

1. Selection of the room and equipment.
   a. Good lighting to allow the surgeon to see tiny structures in a deep chest cavity.
   b. A quiet room because the patient needs the undivided attention of the surgeon while he is suturing life-holding vessels.
   c. Adequate explosion-proof materials to allow for the use of explosive anesthetics.
   d. Facilities to allow qualified visitors to see without contaminating the field.
   e. Operating table and pad of a type adaptable to the size of the patient.
      1) The pad must be firm for a small child or he is lost on the depth of the material.
      2) An adult may have a soft foam rubber type of pad.
      3) The table should be of a type to allow it to be raised or lowered to fit the surgeon's need. A right or left lateral tilt must be available.
      4) The necessary table attachments must be assembled.

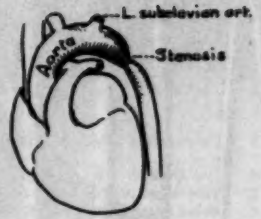


Fig. 3
Coarctation of the Aorta

2. Selection of personnel.
   a. The assignment of a scrub nurse who has ade-

Fig. 7
Potts-Smith Cardiac Instruments
(courtesy, B. Richter Mfg. Co.)

quate preparation in cardiac surgery and understands what the surgeon is contemplating prior to the actual operating time.

b. The staff to circulate must have the necessary understanding, speed, and efficiency to assist properly the surgical team.

3. Proper preparation of instruments and materials for the case.

Forceps, Rochester Pean, curved	18
Forceps, Kelly-Halsted, straight	36
Forceps, Ochsner, straight	6
Forceps, Allis, tissue	6
Scissors, Dissecting, curved, 6¼ inch	1
Scissors, Dissecting, straight, 6¼ inch	1
Scissors, Suture	2
Knife, No. 4 with #20 blade	2
Forceps, Tissue, 5½ inch	2
Forceps, Dressing, 5½ inch	2
Holder, Needle	4
Clamp, Towell	18
Retractor, Tissue, 6-prong	2
Retractor, Army	2
Retractor, Richardson	2
Elevator, Periosteal, blunt	2
Elevator, Periosteal, sharp	2
Raspatories, Right and Left Doyen	2
Shears, Rib, Bethune	1
Forceps, Rib-holding, Lion Jaw	1
Forceps, Bone, Rongeur, Angular	1
Forceps, Bone, Rongeur, Straight	1
Forceps, Bone, Cutting, Curved	1
Forceps, Bone, Cutting, Straight	1
Spreader, Rib, Finochietto	1
Forceps, Potts-Smith, Serrefine 12 inch, Fig. 7	3
Forceps, Johns Hopkins, Occluding, straight and curved with ratchet, Fig. 8	4
Forceps, Artery, Diffenbach or Bulldogs, 3 sizes, Fig. 8	12
Clamp, Potts-Smith, Aortic, 3 sizes ,Fig. 7	3
Clamp, Bialock, Fig. 8	3
Forceps, Potts-Smith, Ductus, Angular, Fig. 7	2
Clamp, Johns Hopkins, Interatrial, Fig. 8	1
Scissors, Potts-Smoth, Angular, Fig. 7	1
Forceps, Potts-Smith, Coaretation, Fig. 7	2
Holder, needle, Potts-Smith, Fig. 7	1
Approximator, Rib	1
Forceps, Cystic duct, Lahey	4
Scissors, Dissecting, Curved, 10 inch	1
Scissors, Suture, 10 inch	1
Knife, No. 7 with #15 blade	2
Needle, Aneurysm, Lahey	1
Forceps, Mayo-Pean, Curved, 8 inch	12
Forceps, Sponge	4

Tips, Suction, Curved	2
Retractor, Flexible, two-bladed	2
Caliper, MM	1

c. Special sterile articles:

Syringe, Asepto or ear bulb	3
Tape, Umbilical ¼ inch	1 yard
Tubing, Penrose ¼ inch	1 yard
Tubing, Soft Rubber ⅛ inch	2 feet
Tubing, Suction	
Catheters, Foley #20 with 5 cc. bag	1
Catheters, Ponzar #18 and #20	2
Syringe, Luer-Lok, 10 cc.	1
Needle, hypo #20, blunt	1
Procaine 1%	30 cc
Fibrin foam and thrombin	2 units
Bottle, underwater drainage and tubing	1
Attachments, Electro Surgical	1
Penicillin, 100,000 U per cc.	4 cc.

d. Other materials:

Electrosurgical Unit (Not desired if cyclopropane is used)	1
Suction Machines	2
Blood Transfusion Equipment	
Anesthesia Equipment	
Bridge, Cutdown, guard	1
Standard, portable, I.V. (Fig. 4)	1
Standard, portable, drainage (Fig. 5)	1

e. Sutures: (Fig. 6)

Ties	Layer	Sutures
000 Catgut	Skin	0000 Silk
	Subcutaneous	00 Catgut
000-00 Catgut	fat	
0000-000 Silk	(Fascia)	0 Catgut
000-00 Catgut	(Muscle)	00 Silk
	(Fascia)	
Bone Wax	Rib	#2 Catgut #28 Wire
0000-000 Silk	Pleura	00000 Silk

The intercostal vessels are usually ligated with an 18-inch strand of 000 or 00 silk.

The anastomosis is made with 5-0 silk suture on a #9 needle. Some surgeons prefer to transfix all intercostal vessels with suture so an ample amount should be on hand.

f. Needles:

Skin	Keith Abd Straight 2½ inch	2
Subcutaneous fat	Ferguson #6 ½-circle, taper point	2
Fascia) Muscle) Fascia)	Ferguson #4 ½-circle, taper point	2
Rib	Regular Surgeons #6 Cutting	2
Pleura	French Eye #2 ½-circle, taper point	2
Intercostals	Intestinal #3 ½-circle, taper point	3
Anastomosis	00000 silk suture on #9 needle or French Eye	4

The Operative Procedure

There must be complete co-ordinated team work prior to the actual operation time. Everything must be ready for the surgeon at the exact hour he desires to operate. This is especially true when the patient has a tetralogy of Fallot, as undue anxiety or crying will endanger the life of the patient.

Contrary to popular belief, the heart and great vessels are not necessarily approached through the left side of the chest. The variations in approach are as follows:

1. Patent ductus
   a. Anterior submammary incision on the left side.
   b. Posterolateral incision on the left side.
   c. Dorsal recumbent position on the left side, with the left arm extended over the head. Support by a long sandbag anteriorly and a small one under

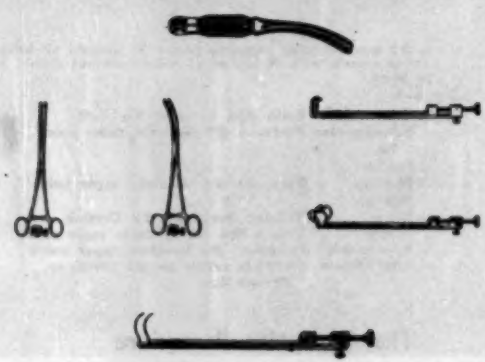


Fig. 8
Johns Hopkins Instruments
for Cardiovascular Surgery
(courtesy, Sklar Manufacturing Co)

the left shoulder. The incision is usually in the fourth interspace.

2. Tetralogy of Fallot
   a. Posterolateral incision on the left side.
   b. Posterolateral incision on the right side.
   c. Lateral position with the approach on the side of the apex of the heart, regardless of the position of the aortic arch or the age of the patient.
   d. Lateral position with the incision in the 4th interspace according to the aortic arch as follows:
      1) If the arch curves to the right, a subclavian pulmonary anastomosis is made on the left side.
      2) If the arch curves to the right in an infant, the right side is entered and an aortic pulmonary anastomosis is made.
      3) If the arch curves to the left in a child or adult, an aortic pulmonary anastomosis is made on the left side.
3. Coarctation of the Aorta.
   a. Lateral position with left side up and incision in the 4th interspace.
   b. Lateral position with left side up but an exceptionally long incision extending to the level of the second thoracic vertebra.

In all cardiac cases the preparation during the anesthesia period is similar. A venous cannula is inserted usually in the saphenous vein at the ankle, for the administration of blood. This is adequately protected by a small wooden bridge or a Mayo stand over the foot prior to draping. The patient is placed in the desired position. The operative area is prepared and proper drapes placed over the patient. The Mayo stand and other equipment are conveniently assembled so that they are available to the surgical team and do not hinder the circulating personnel. The surgeon makes the incision when the anesthesiologist has the patient in the stage of anesthesia desired.

The skin incision is made; the bleeding points are clamped and ligated. Skin towels are placed over the skin and clamped; the skin instruments are discarded in a basin. The muscles and fascia are divided down to the ribs; the vessels clamped and ligated. The chest is opened or, prior to this in an adult, a rib resection is done. All sponges are removed from the field, as most surgeons prefer the use of irrigation and suction to remove blood and allow better vision of the structure without distortion. The lung is collapsed, covered with a moist lap pad and retracted. As the anesthetist now controls the patient's breathing, it may take a few moments for him to stabilize the respirations by rhythmic pressure on the anesthetic bag.

The important variations in the surgery that occur at this point in the operation are:

1. Patent Ductus

   The ductus is located by visual aid as well as palpating the point of maximum thrill. An incision is made into the mediastinal pleura and traction sutures of 0000 silk placed on either side of the incision. The pericardial fold, which overlies the ductus, is separated. The ductus is freed of any material adhering to it. A Lahey cystic duct forceps is placed beneath the ductus, and a small penrose drain drawn through to retract it while the dissection is completed. Potts forceps are then placed at either end of the ductus. In one method the ductus may now be ligated at either end with 000 silk followed by a 00000 silk fixation suture. The other method is to sever the ductus by means of a Potts-Smith scissors. The stumps are sutured continuously with 00000 silk suture on a #9 needle. The clamps are removed slowly to make certain there is no bleeding. Fibrin foam and thrombin or Gelfoam are placed over the suture line. Penicillin may be instilled about the area. The mediastinal pleura is closed with interrupted sutures of 00000 silk on a #9 needle.

2. Tetralogy of Fallot

   a. Potts Method

      The chest is opened in the manner described previously. The right or left pulmonary artery must be identified. The veins are disssected from the artery and ligated with 000 or 0000 silk. Two double encircling 00 silk ligatures are placed around each branch of the artery and one around the pulmonary artery itself. These are not tied at this point but used for traction purposes until they are tied to the Potts clamp prior to the anastomosis.

      The aorta is freed of any material around it at the site of the anastomosis usually about 2 cm. distal to the origin of the subclavian artery.

      The proper size of Potts-Smith aortic clamp is placed about the aorta. The ligatures encircling the pulmonary artery are then threaded through the flanges of the clamp in a figure-of-eight manner by using a Lahey Aneurysm Needle or a large, blunt, Ferguson needle placed back-

wards on a long needle holder. The ligatures are drawn up to place the pulmonary artery in the proper position for the anastomosis. The ligatures are then tied and the ends cut. The aortic clamp is tightened to occlude the blood in a small portion of the aorta without disturbing the required amount to the distal portion of the vessel.

The incision into the aorta is made with a No. 15 blade on a No. 7 knife handle. The incision is enlarged by means of a Potts-Smith scissors to the desired length of 5 to 8 mm. A continuous suture of 00000 silk on a No. 9 needle completes the anastomosis. Rarely, if ever, is another stitch needed to control bleeding from the suture line.

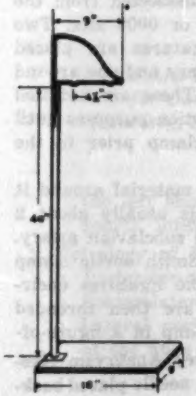
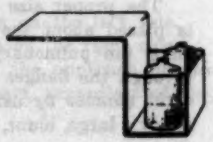


Fig. 4
Portable I.V. Standard

Fig. 5
Portable Drainage Standard



Following the anastomosis the ligatures on the pulmonary artery are released; first the lower one, then the upper one so that a small amount of blood can get into the vessel and close the pin point wounds before the clamp is released. The clamp is removed from the vessels with proper caution. Fibrin foam and thrombin or gelfoam may be placed over the anastomosis. Penicillin may be instilled into the chest cavity at this time.

b. Blalock Method

In this method the most desirable of the left subclavian, left common carotid or innominate arteries is ligated with 000 silk, then divided, and the proximal end turned downward to do an end-to-side anastomosis with the pulmonary artery. The Blalock clamp is applied to occlude the pulmonary artery and to enable the anastomosis with the other artery to be performed. The clamp, in many cases, is covered with 1/8 inch soft rubber over the jaws.

The incision into the pulmonary artery is made with a No. 15 blade on a No. 7 knife handle. The size of the incision is dependent on the size of the artery in the anastomosis. A 00000 silk suture is used to make the anastomosis. In some instances single sutures are used and in others an over-and-over continuous suture is used to draw perfectly the two vessels together.

Fig. 6
Layers of
the Chest

3. Coarctation of the Aorta

The site of the aortic stenosis is found and the suitable type of anastomosis decided by the surgeon. In most instances a small segment of the aorta may be removed and the vessel itself is elastic enough to permit an end-to-end anastomosis.

Depending upon the location of narrowing, Bulldog clamps may be temporarily applied to occlude the blood distal to the anastomosis in the feeder vessels.

The types of forceps placed at either end of the segment to be resected are: Johns Hopkins occluding straight and curved, or the Potts coarctation forceps. Either may be used to stop the flow of blood from the aorta prior to the anastomosis.

In some hospitals the end-to-end anastomosis is done with 00000 silk suture on a No. 9 needle or 00000 silk on a small curved intestinal needle. Most surgeons use a continuous mattress suture which brings intima to intima and promotes faster healing.

In children where the narrowing between the left subclavian artery and aorta is short, a Johns Hopkins modified Potts clamp is used. The clamp is used to occlude the aorta without endangering the flow of blood up the left subclavian artery. In this instance the anastomosis more closely resembles an end-to-side anastomosis.

The Closure

Upon completion of the major portion of the operation, the chest is irrigated with warm saline. The lungs are carefully expanded while the solution is in the cavity to make certain no tears have been made in the lung tissue. A Pezzar or Foley catheter is inserted through a stab wound, usually in the sixth intercostal space. The ribs are approximated with heavy catgut or wire sutures. The muscle and fascia are closed with continuous chromic catgut sutures or interrupted silk sutures. A few subcutaneous sutures of catgut are placed prior to suturing the skin adges. The dressing is placed over the entire incision and firmly fastened with elastic adhesive so that respiratory movements are not impaired.

The underwater drainage bottle is connected immediately. The advantage of a portable drainage unit is that no time is allowed for the catheter to clog, and the surgeon may alter immediately the catheter if he so desires.

The patient is placed on the litter, ready to be taken to his room. The use of the portable I.V. Standard is necessary because vital fluids continue to be received during his travel to his room without additional personnel accompanying him just to support the fluid bottles. A small "D" tank of oxygen may be placed on the litter to allow him to receive continuous oxygen if necessary.

Upon arrival in his room the portable drainage unit is placed under the mattress of his bed. This lessens the

danger of anyone unconsciously picking up the bottle while sweeping or cleaning. Also, there is no possibility of knocking the bottle over and breaking the water-tight seal from the chest drainage.

The operating room nurse who is adequately prepared for any of the types of procedures described will be able to cope with situations that arise unexpectedly, if the type of anastomosis planned must be suddenly altered to fit the needs of the patient during the operative procedure. The portal vein-vena cava anastomosis, the technic for tricuspid atresia, and many others are all variations of these basic procedures described.

These three types of abnormalities, which occur mostly in the great vessels of the heart, are fairly common. The present surgical technics, although they vary somewhat, are very gratifying in that young people or infants are given a hopeful prognosis of a normal future rather than the previously doomed life of an invalid. The operating room nurse who has an opportunity to work in this field will find stimulation and satisfaction.

Bibliography

1. *Potts, W. J.; Gibson, S.; Smith, S. and Riker, W.: Diagnosis and Surgical Treatment of Patent Ductus Arteriosus, Archives of Surgery, Vol. 58, pp. 612-622 (May) 1949.*
2. *Blalock, A., and Taussig, H. B.: The Surgical Treatment of Malformations of the Heart in which There is Pulmonary Stenosis or Pulmonary Atresia, J.A.M.A., Vol. 128, pp. 189-202 (May) 1945.*
3. *Potts, W. J., and Gibson, S.: Aortic Pulmonary Anastomosis in Congenital Pulmonary Stenosis, J.A.M.A., Vol. 137, pp. 343-347 (May) 1948.*
4. *Gross, R. E.: Surgical Treatment for Abnormalities of the Heart and Great Vessels. The Beaumont Lecture. Springfield: Charles C. Thomas, 1947.*
5. *Potts, W. J., and Smith, S.: New Surgical Procedures in Certain Cases of Congenital Pulmonary Stenosis, Archives of Surgery, Vol. 59, pp. 491-496 (Sept.) 1949.*
6. *Fell, E. H.; Gasul, B. M.; Davis, C. B. Jr. and Casas, F.: Surgical Treatment of Tricuspid Atresia, Archives of Surgery, Vol. 59, pp. 445-453 (Sept.) 1949.*
7. *Potts, W. J.: Surgical Treatment of Patent Ductus Arteriosus, Surgery, Gynecology and Obstetrics, Vol. 88, pp. 571-576 (May) 1949.*
8. *Alexander, E. L.h: Operating Room Technique, pp. 387-391, St. Louis: C. V. Mosby Company, 1949.*

New Sterilizing Rack Helps Save Life of Rubber Surgical Gloves. Gloves, properly wrapped and placed in Rauh Rack, come up to temperature quicker and after sterilization time, cool down faster. Exposure to high temperatures is cut down while all gloves receive same sterilization. Lightweight, easy to handle. Sturdily constructed of zinconized steel basket wire, welded together and rustproof. 36 pairs of gloves in wrappers fill rack without excessive packing.

Outline of Course in O. R. Technic

Sister Magdalen Rosaire
St. Vincents Hospital School of Nursing
New York City

HOURS .....30 hours
PLACEMENT OF COURSE.....Junior Year

TEACHING METHODS

1. LECTURES .....27 HOURS
2. DEMONSTRATIONS
3. FILMS AND SLIDES..... 2 HOURS
4. PRACTICAL EXPERIENCE
5. REQUIRED READINGS
6. EXAMINATIONS OBJECTIVE TYPE.. 1 HOUR
7. CONFERENCE WITH STUDENT AT THE COMPLETION OF HER COURSE TO EVALUATE HER EXPERIENCES

The course in operating room technic offers the student an opportunity to acquire scientific knowledge and manual dexterity in the treatment of a surgically ill patient.

The General Objective of the course aims at developing in the student an aseptic conscience thereby enabling her to render to the surgeon and the patient the best possible service.

It is the aim of this course to thoroughly imbue the student with a knowledge of the moral obligations dictated by our belief.

OBJECTIVES OF THE COURSE

1. To aid the student in the development of a full realization of the ultimate end of man, namely his eternal salvation.
2. To train the student in the principles of aseptic operative technique and routines.
3. To develop a sense of responsibility to the surgeon and to the patient.
4. Through a planned program to assist the student in the development of a knowledge of operative procedures and basic skills in caring for the patient while in the operating room.
5. To aid the student in the developing of an appreciation of this service and its relation to the patient's complete restoration to health and return to society.
6. To give the student an opportunity to observe the notable advances in operative technique in cardiovascular, pulmonary, esophageal, plastic, and neuro-surgery fields.

7. To inculcate a profound respect for honesty and integrity.
8. To assist the student in acquiring a knowledge of the economic value of sterile supplies and equipment.
9. To give the student an opportunity to develop latent potentialities in this speciality and if capable, be encouraged to pursue this type of work on a graduate level.

Lecture I — Orientation (Nurse) 3 Hours

A. Professional relationships
   1. Attitude
   2. Behavior
   3. Personal appearance
   4. Health habits
B. Classification of Personnel
   1. Levels of authority
   2. Delegation of duties non-professional
   3. Responsibilities listed
C. Desirable qualifications for operating room nurse.
D. Ethical principles inculcated in techniques and procedures.
E. Short History of Development of Surgery.
F. Floor plan of operating rooms
   1. Contents of rooms

Lecture II — Preparation of Patient — Pre-operative (Nurse) 1 Hour

A. Contents of Preparation Tray
   1. Areas prepared as shown on anatomical cards.
   2. Procedure of Preparation
   3. Health teaching principles
B. Duties of Circulating Nurse (Nurse) 2 Hours
   1. In operating room—Pick up forceps
      a) Pre-operatively
      b) During operation
      c) Post-operatively—clean cases
      d) Post-operatively—contaminated cases
      e) Positioning of patients
C. Demonstrate scrubbing of instruments, use of electrical units (lights, cauteries), suction apparatus, operating room tables.

Lecture III — Anesthesia (Doctor) 1 Hour

A. Types of anesthesia
   1. General 2) Local or Reginal 3) Spinal
   2. Indications for use of each type
   3. Preparation for each type
   4. Usual response to various types of anesthesia.
B. Preparation of Trays (Nurse) 1 Hour
   Demonstrate
   1. Care of anesthesia equipment.

Lecture IV — Preparation of Supplies (Nurse) 3 Hours

Demonstrate:
A. Folding and Wraping Linen
B. Packing—culture tubes—applicators—rectal pads—tapes—sponges.
C. Gloves
   1. Washing—drying—powdering—packing
   2. Use of glove machine
D. Rubber Drains

1. Types—Pinrose, cigarettes catheters (whistle tip) foley, french cysto tubes, perineal and T tubes.

E. Vaseline Gauze

Lecture V — Sterilization (Nurse) 2 Hours

Types

A. Physical
   1. Water—steam—Hot air
      a) Methods used in specific situation
   2. Equipment sterilized
   3. Length of time.

B. Chemical
   1. Alcohol
   2. Bard Parker
   3. Zepheran Chloride
   4. Mercury Cyanide
   5. Formalin
   6. Carbolic Acid
      a) Methods used in specific situation
      b) Equipment sterilized
      c) Length of time

Demonstrate autoclave—water tanks—water sterilizer.

C. Time of sterilization
   1. Linens
   2. Gloves
   3. Instruments etc.

D. Application of health principles related to sterilization

A. Needles — Sutures (Nurse) 2 Hours

1. Names
2. Uses
3. Movies

B. Basic Instruments (Crates kept in units)
   1. Names
   2. Uses of clamps
   3. Photographs of instruments
   4. Abdominal retractors
   5. Dilatation and Curettage
   6. Cholecystectomy
   7. Hysterectomy

Lecture VII — Preparation for Operation (Nurse) 2 Hours

Demonstrate:

A. Scrub Technique
   1. Reasons
   2. Method

B. Donning sterile gown and gloves

C. Duties of Scrub Nurse

D. Demonstration—Set-up
   1. Laporatomy
   2. Dilatation and Curettage
   3. Minor Scrubs
   4. Proctoscopy

E. Application of Plastic Casts

Lecture VIII — A. Draping (Nurse) 1½ Hours

1. Consideration of modesty and respect for patient.
2. Abdominal
3. Vaginal
4. Rectal

5. Prostetectomy—(one stage)
6. Thyroid
7. Breast
8. Laminectomy

Lecture IX — A. Genito-Urinary (Nurse) 1 Hour

1. Cystoscopy
   a) Definition
2. Demonstrate set-up
   a) Use of instruments
   b) Cleaning of same
   c) Storage of instruments
3. Transurethral
   a) Definition
b) Demonstrate set-up

Lecture X — A. Head and Neck (E.N.T.) (Nurse) 1 Hour

1. Radical Neck
2. Tonsillectomy and Adenoidectomy
3. Submucous
4. Bronchoscopy

Lecture XI — A. Intestinal Instruments (Nurse) 1½ Hours
1. Use
2. Clean—technique
3. Contaminated technique

Lecture XII — Orthopedic Instruments and Draping (Nurse) 1½ Hours

Lecture XIII — Neurosurgical Instruments and Draping (Nurse) 1½ Hours

Lecture XIV — Chest Instruments and Draping (Nurse) 1½ Hours

Lecture XV — Examination 1 Hour
1. Objective Type
2. Conference with students

27½ Hours of Lecture and demonstration—balance of course hours selected films.

BIBLIOGRAPHY

1. Alexander, E., Operating Room Technique, St. Louis, C. V. Mosby Co., 1st edition, 1943.
2. Alexander, E., Operating Room Technique, St. Louis, C. V. Mosby Co., 2nd edition, 1949.
3. Blalock, A., Principles of Surgical Care, St. Louis, C. V. Mosby Co., 1940.
4. Handbook of Hospital Corp. U.S. Navy, 1939, U.S. Government Print Office, Washington, Bureau of Medicine and Surgery.
5. Baurke, Rev. M. P., Some Medical and Ethical Problems Solved, Milwaukee, The Bruce Publishing Co., 1937.
6. Carini, E., R.N.—Robinson, F., M.D., Acute Craniocerebral Injuries, American Journal of Nursing, July 1950, p. 423.
7. Curtis, D. E., Knowing about Operations Helps, American Journal of Nursing, January 1943.
8. Eliason, E., Ferguson, L., and Fouand, E. M., Surgical Nursing, Philadelphia, J. P. Lippincott Co., 7th edition, revised 1946.
9. Eliason, E., Ferguson, L., Sholtis, L., R.N., Surgical Nursing, Philadelphia, J. P. Lippincott Co., 9th edition, revised 1950.
10. Faulk, H., Operating Room Technique for Nurses and Internes, New York, London, G. P. Putnam's Sons, 1st edition, 1934.
11. Finney, Rev. P.A. C.M., Moral Problems in Hospital

Practice, St. Louis B. Herdes Co., 1930.
12. Lennon, Mary I Sister, Professional Adjustments, St. Louis, C. V. Mosby Co., 2nd edition, 1950.
13. Lewis, D., Practices of Surgery, Maryland, F. Prior Co., June 1950.
14. McFadden, Charles, O.S.A., Medical Ethics, Philadelphia, F. A. Davis Co., 1949.
15. O'Neill, A., Operating Room Technic, Philadelphia, F. A. Davis Co., 2nd edition, 1948.
16. Palumbo, L., M.D., Some Recent Advances in Surgery, American Journal of Nursing, October 1950, p. 658.
17. Rothweiler, E., White, J., The Art and Science of Nursing, Philadelphia, F. A. Davis Co., 4th edition, 1948.
18. Walters, C., Aseptic Treatment of Wounds, New York, Macmillian Co., 1948.
19. Manual of O. R. Procedures, Walter Reed General Hospital, 1948, not published.

Question Box

Q. Why would it not be practical and time-saving to print different ampoules of drugs in different colors for quick selection?

A. No, because it superimposes the need of memory rather than habit of reading, understanding and reading again.

Q. Is the rim of a jar containing ampoules being sterilized in aqueous germicides considered sterile?

A. No, you must use a heat sterilized jar and cover to begin with.

Q. Is "Glim" a germicide?

A. "Glim" is not a germicide, but when used with certain germicides it greatly increases their efficiency in the presence of protein.

Program Suggestions for A.O.R.N. Meetings

ONE of the specific aims of the Association of Operating room Nurses has been to pool knowledge and experience in the field of operating room nursing. Thus at A.O.R.N. meetings, after the business of the association has been taken care of, attention is turned to the speaker or the demonstration planned. Programs should be interesting and of value to operating room personnel in attendance. The New York City group has had some instructive and informative sessions during the past year. A list of these appear below for the benefit of other groups.

January 24— "Fire and Explosion Hazards in the O.R.
Roy Hudenberg
American Hospital Association

February 28— "Burns: Their Surgical Repair and the Problems They Present to the O.R. Staff"
John D. Reese, M.D.
Chief, Department of Plastic Surgery
Philadelphia General Hospital

March 28— "Exhibits of Novel Ideas, Clever and New Procedure & Practical Short Cuts in the Operating Room"
Exhibits brought by Nurses

April 23— "Cardiac Surgery"
Dr. Elliott S. Hurwitt
Montefiore Hospital, New York City

May 16— "The Dorsal Lumbar Flap Incision in Urological Surgery"
Dr. George P. Nagamatieu
New York Medical College
Flower Fifth Avenue Hospital, New York City

June 27— "Practical Application of the Artificial Kidney"
Dr. Thomas Johnson
St. Clare's Hospital, New York City
Demonstration of Apparatus by William Galler, American Cyctoscope Makers, Inc.

September 25— "Draping the Patient in the Operating Room"
Demonstrations by:
Head drape for brain surgery
Beth-Israel Hospital
Shoulder drape for open reduction
Fordham Hospital
Lithotomy drape
Lincoln Hospital
Throidectomy drape
St. Vincent's Hospital
Hip drape for orthopedic surgery
Bronx VA Hospital
Nephrectomy drape
St. John's Hospital
Ear drape
New York Eye & Ear Hospital

October 17— "Question & Answer Program
Dr. Carl W. Walter
Peter Bent Brigham Hospital
Boston

November 28— Team Work in the Operating Room
Dr. E. John Dolan
Medical Superintendent
Westchester Square Hospital
Bronx

Principles and Practice of Operating Room Nursing

Leone DeLelys, R.N., Cornell University
New York Hospital, School of Nursing

TIME: Organized instruction.....15 hours
Supervised practice.....8 weeks

PLACEMENT:.....Second Year

TEACHING PERSONNEL: Miss DeLelys and Operating Room Staff.

METHODS: Lecture, demonstration, conference, supervised practice, reference reading and examination.

PLACE: Classroom and operating room suites.

OVERVIEW:

This course is planned for students on the basic nursing level, and is given in an 8-week period during the second year. The content is intended to give students functional information of operating room nursing and an understanding of the principles which are the basis for effective nursing care of operative patients.

An objective type written test is given at the end of the formal instruction. Provision is made for student activity in the form of supervised experience in the clinical unit to help her integrate theory and develop skills. In order to further this aim, anecdotal records and progress reports are made for the evaluation of student progress. Individual conferences are used for the motivation and guidance of the students.

AIM:

To develop an appreciation of the part which surgery plays in the total hospital experience of the patient in order to plan for more effective nursing care.

OBJECTIVES:

1. To understand the principles of aseptic operative technic, and become increasingly skillful in their application to nursing procedures in the operating room unit.
2. To acquire a basic knowledge of common surgical procedures.
3. To gain a greater appreciation of the contribution of optimum pre-operative and post-operative nursing care to safe and effective surgery.
4. To acquire ability to give more effective immediate pre-operative and post-operative nursing care.

5. To acquire some dexterity in performing the more common nursing procedures in the operating room.
6. To appreciate the cost of supplies and equipment, the need for keeping them in good condition, and learn methods for the conservation and efficient use of resources.
7. To appreciate the need for a cooperative spirit in the operating room, and acquire habits of cooperation.

TOPICAL OUTLINE OF COURSE

Unit I. Nursing Care of Patients in the Operating Room

Lesson 1. The operative experience related to the patient
Psychological aspects — 1 hour
Lesson 2. The operative experience and the patient (Con't)
Physiological aspects — 1½ hours

Unit II. The Role of the Nurse in the Surgical Team

Lesson 3. The "Circulating" nurse — 1½ hours
Lesson 4. Demonstration of Minor Case Set-Up — 2 hours
Lesson 5. Return Demonstration of Minor Case Set-Up — 2 hours
Lesson 6. Demonstration of Major Case Set-Up — 1½ hours
Lesson 7. Return Demonstration of Major Case Set-up — 2 hours

Unit III. Providing for Safe and Effective Surgery

Lesson 8. Care of Contaminated Cases — 1½ hours
Lesson 9. a. Modern surgical technology — 1 hour
b. Meeting emergency situations
Written examination — 1 hour

General Operating Room

Undergraduate Program: Orientation.

(First Day)

8:30-9:30	Conference with Assistant Supervisor, Miss DeLelys, F1071: Introduction to O.R.
9:30-10	Distribution of mimeographed material and references.
10-10:30	Assignment to lockers: gowns, caps and masks.
10:30-11:30	Tour of O.R.
11:30-1	Reference Reading for Class 1.
1:00-2:00	Luncheon
2:00-3:00	Class 1 in O.R. Technic
3:00-5:30	Observation in "C" or "D" O.R. related to Class 1.

Conference Schedule of Informal Teaching

(a) Positioning of patients: O.R. table and attachments
(b) Special Duties
Pre-operative skin preparation
(c) Sutures

(d) Sterilization of supplies

Outline for Operating Room Case Presentation

I. **Objective:**

To gain an appreciation of optimum nursing care in the operating room through an understanding of those factors which may influence the outcome of surgery and the welfare of one particular patient.

II. **Method:** Oral Case presentation.

III. **Time:** 1 hour.

IV. **Selection of the patient:**

The patient should be chosen on the basis of personal interest, and learning value to the group.

Select a patient who will be operated on in the unit to which you are assigned. Plan to take advantage of the opportunity to learn during the time he is in the operating room, through talking to him, reading the chart, listening to the surgeons' comments, and observing the operation.

V. **Topical Outline:**

A. Description of the patient: age, education, social position, family status, etc.

B. Relevant past medical history.

C. Present illness: physical examination, tests, diagnostic measures, significance of abnormal findings.

D. Preparation for surgery.

E. Surgical Procedure:

Explain in sufficient detail so that the procedure is clear. Anatomical diagrams, x-rays, special surgical instruments may be used for illustrations.

F. Post-operative course.

G. Prognosis; rehabilitation.

VI. **Conclusion:**

Indicate significant points in the nursing care of this patient in thhe operating room which would contribute to maximum effectiveness of surgery.

VII. **Question and discussion period.**

OPERATING ROOM CASE STUDY

Objective:

To provide an opportunity to evaluate the operative procedure in its relationship to total care of the surgical Patient—in order to plan for pre- and post-operative care in future situations.

This report is to be written by the student after having observed and cared for a specific patient on the day of operation. It should include nursing care, and operative and post-operative observations with an interpretation of their significance to the patient's recovery. The outline below may be used as a guide in writing the report of your observations.

Patient's initials	Date of admission
Patient's age	Date of operation
Pavilion	Days observed by student

(Continued on page 31)

Plan for Undergraduate Experience in the Operating Room

Week	Formal Teaching	Informal Teaching	Clinical Experience	Evaluation
1.	Principles & Practice of Operative Technic—8 hrs. 1. Psychological aspects 2. Physiological aspects 3. "Circulating" nurse 4. Minor case 5. Return demonstration	Orientation Group conference—3 hours 1. Positioning of patients 2. Special duties 3. Pre-operative skin preparation Assignment and references	Tour of O.R. Planned observation related to classes Care of patients in O.R.	
2.	Principles & Practice of Operative technic—6 hrs. 6. Major case 7. Return demonstration 8. Contaminated case technic 9. a. Modern surgery b. Emergency situations	Group conferences—2 hours 1. Sutures 2. Sterilization	Planned observation Basic circulating duties 2nd scrub for selected cases	Written exam 1 hour
3.		Grand Surgical Rounds—1 hr. OR In-Service Programs *	Circulating duties Scrub for minor cases 2nd scrub for major cases Special student duties Pre-operative skin preparations (1 week rotation)	Review of exam.
4.		Grand Surgical Rounds—1 hr. Student case presentation—oral **	Same as 3rd week	Progress report Student-Head Nurse Conference
5.		Same as 4th week	Same as 4th week	
6.		Same as 5th week	Same as 5th week	

Week Formal Teaching	Informal Teaching	Clinical Experience *	Evaluation
7.	Grand Surgical Rounds Nursing care study —written ***	Circulating duties Scrub minor cases 1st scrub selected major cases Observation of special surgery: 1. Neurology 2. Urology See 3. Plastic rotation 4. Orthopedic 5. Eye, ENT	
8.	Same as 7th week	Same as 7th week	Review of case study Final progress report Student-Head Nurse Conference Student-Supervisor Conference

* Attendance as indicated
** Each student to present one case to the group
*** Each student to write one nursing care study

Pre-Operative Period:

Diagnosis and brief history of the patient
Patient's attitude towards hospitalization
Treatments: X-ray, transfusions, infusions, etc.
Medications: general, specific
General nursing care of pre-operative patient
Preparation of patient for operation: physical and psychological

The significance of this period to the operative period should be explained.

Operative Period:

Transportation to O.R.
Anesthesia room observations
Equipment set-up and ready for patient
Attitude and actions of personnel
Patient's reactions
Preparation of patient
Type of anesthesia used
Operating room observations
Position of patient on operating table, precautions taken to prevent injury
Attitude and actions of personnel
Steps taken to insure the physical safety of patient
Brief statement as to the operation itself

This should not be an involved step-by-step statement of the procedure but merely a statement of what was found and what was done or what organ was removed, and its significance to the planning of post-operative care for the patient.

Statement regarding patient's prognosis based upon operative findings

Post-Operative Period:

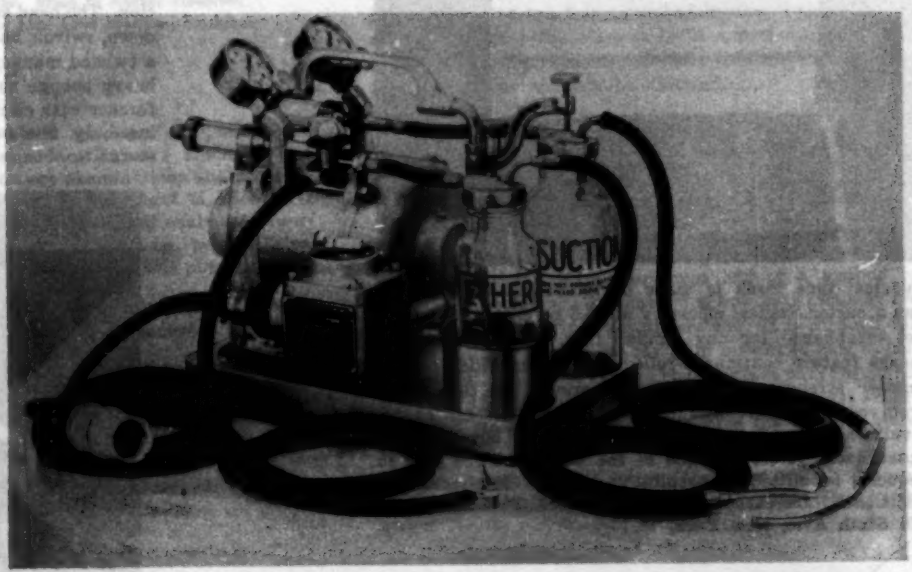
Undergraduate Program — General Operating Room Rotation Plan — Group of 7 Students

Students	1st Week	2nd Week	3rd Week	4th Week	5th Week	6th Week	7th Week	8th Week
1	General Surgery "C" OR	→	Skin Preparations 1-10p.m.	E.N.T. "F" OR	Plastic "I" OR	General Surgery "C" OR	→	→
2	General Surgery "C" OR	→	→	→	→	Plastic "I" OR	E.N.T. "F" OR	Skin Preparation 1-10p.m.
3	General Surgery "D" OR	→	→	Skin Preparations 1-10p.m.	E.N.T. (AM) "F" OR	Urology "J" OR	General Surgery "D" OR	→
4	General Surgery "D" OR	→	→	→	→	Skin Preparations 1-10p.m.	Urology "J" OR	E.N.T. "F" OR
5	General Surgery "L" OR	→	→	→	→	E.N.T. "F" OR	Skin Preparations 1-10p.m.	Urology "J" OR
6	General Surgery "L" OR	Skin Preparations	E.N.T.	General Surgery "L" OR	→	→	→	Plastic "I" OR
7	Urology "J" OR	→	→	→	E.N.T. (PM) Skin Preparations	General Surgery "L" OR	→	→

END OF TWO-WEEK DAILY CLASS PERIODS

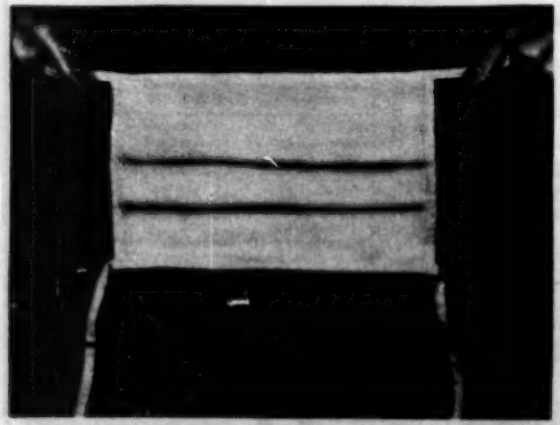
Transportation from O.R. to recovery room and pavilion
Attention to post-operative orders — their significance to the patient
Observations made of physical condition and their significance:
Temperature, pulse, color, dressings, etc.
Observation of psychological reactions
Complications: prevention of; care of
Patient-teaching possibilities
Evaluation:
How do you feel that you have helped this patient during the brief period you were able to care for him?
What do you feel that you have learned from this type of case study?

New Products for the O. R.



This fireproof and explosion proof suction, pressure and anesthesia apparatus, is designed for use where highly volatile anesthetic agents are used and provides for the dissipation of static electricity. Approved by Underwriters' Laboratories, it has a heavy duty, 1/6 H.P. spring-suspended motor, suction and pressure gauges with regulating valves and a two-way pressure by-pass valve. It is quiet, vibrationless and portable and requires no care except lubrication.

Gomco Surgical Mfg. Co.



Surgical face mask is made of flannel-lined gauze and has a bacteriological efficiency of 98.6 percent, the highest yet established for any similar face mask. These face masks feature continuous-rolled tape edges which impart greater strength and durability—preventing the masks from coming apart and serving to retain their shape. Available in packages of 12, supplied in boxes of six dozen each. A free sample of the masks will be sent to requests submitted on hospital stationery. For mask and additional information write: Institutional Products Corp., 161 Sixth Ave., New York, 13.

The Eaton Headrest adjusts to any position required in proper anesthesia technic. The base of the unit consists of an eccentric platform to prevent tipping with the upright portion designed for easy application of the face piece when patient is in a prone position. The head support adjusts up and down, swivels backward, forward or in a twisted manner. Headrest proper is heavy sponge rubber to reduce interference with circulation. Small, weighing only five pounds, it is easy to store.

Observational Technics in Evaluation of Students

Report of a paper presented to the Twin Cities Operating Room Supervisors by Margaret Grainger, who is a member of the faculty University of Minnesota School of Nursing and also in charge of the course in Ward Administration for post-graduate students. The paper, given at Ancker Hospital, St. Paul, Minn., is reported by Miss Cleo Mattson, President of the Twin Cities Group.

BLUEPRINTS on which to base evaluation are necessary in the consideration of a student. Two phases of evaluation are examinations and observation. The examination method is important to discover if the student knows the facts. This type of evaluation however, makes it difficult to discover attitudes, personalities, etc., of the student. Observation serves this purpose.

Several requirements a good observer must have in order to use this method of guiding a student are:

(1) ability to concentrate attention for long periods of time.
(2) habitual accuracy — observing must become a habit.
(3) infinite patience.
(4) knowledge of the work to be observed.
(5) a habit of recording systematically.
(6) freedom from preconceived and prejudiced notions.

Objectives Should Be Established

Faculty members must prepare objectives for the students and they must know how to observe to determine if these objectives are being reached by the student. A list of performances the student is to experience should be prepared and the student should be informed of these objectives and how she is to be observed.

Observations are recorded by persons selected, prepared and assisted in the matter of observing. The actual performance of the individual is taken down. Called anecdotal records, these are descriptive accounts of activities or occurances in the daily work of the student.

The purpose of the anecdotal record is to increase understanding of individuals. It aids the supervisor to better understand the student's progress and is a method by which the instructor may determine how satisfactorily her classroom teaching is being understood. It is through this record that the head nurse can gain insight in how to help the student. She must keep in close contact with the supervisor and the instructor to know the student's past experience and class work in order to give the student better guidance.

The graduate nurse knows she must set an example since the students also follow her leadership. The student

realizing she must shoulder the responsibilities for her own education, can herself determine areas of strength and areas of needed guidance.

Record Must Be Specific

The anecdotal record must possess specific characteristics. First it should be highly objective. It must state what actually happened and exclude subjective feelings. These subjective feelings should be made as a separate comment or interpretation.

Secondly, the anecdote should be significant in relationship to the objectives. It serves as a real learning process for the student and the records can be interpreted in conferences.

Third, the anecdote should be typical behavior strengths and areas for improvement. Significant activities in relation to the operating room experience should be chosen and a guide set up for the observer. The significant factor in the collection of records is that the average daily performance can be determined. Last, date and record promptly, clearly and to the point.

A special form is not necessary. Each student should have her own envelope in which these records should be kept and which will be available to the student and head nurse at all times. The anecdote should be signed by the writer. This is important in developing the sense of responsibility to stand behind the statement made.

Anecdotes should be summarized periodically by several persons. The supervisor, head nurse and student should all take part and work together.

Exercises Used as Illustrations

Miss Grainger gave the group several exercises illustrating her subject matter. One of these is given below. This example was placed on a blackboard and the Twin Cities group was asked to read, then designate the words in the record which were subjective:

"A new senior nurse was giving the morning circle discussion. Miss B showed her jealousy of the new senior by firing unnecessary questions whenever the opportunity was given. She tried to create difficulties by constantly interrupting during the period. The other nurses showed their resentment by asking her to stop talking. It is apparent that Miss B is a trouble maker and I think the supervisor should have a serious talk with her."

The following words are subjective:

"showed her jealousy"
"unnecessary"
"tried to create difficulties"
"showed their resentment"
"it is apparent that Miss B is a trouble maker and I think the supervisor should have a serious talk with her."

These are all matters of opinion. The anecdote should read:

"A new senior student was giving the morning circle discussion. Miss B fired questions at the senior at

every opportunity. She interrupted several times during the period. The other nurses asked her to stop talking."

Comment:

"Miss B seemed to be jealous of the new senior nurse and desirous of creating difficulties. The other students appeared to resent her actions. Miss B seems to enjoy making trouble for others."

In order to be of value, the anecdote must be an objective statement of the activity and the interpretation or comments should be a separate part of the record.

Surgical Notes

By Dr. James F. Fleming

Study the Patient before Anesthesia

To prevent operating table deaths, or those occurring in the immediate postoperative period, Tovell and Steven, of the Hartford Hospital, recommend thorough investigation of every patient pre-operatively.

Writing in *Insurance Medicine*, they state that every patient should have a roentgenogram of the chest pre-operatively. Fluoroscopy is also a useful tool in studying the patient's respiratory function.

To determine the maximal breathing capacity, the patient breathes rapidly and deeply for a half minute through a wide velocity respiratory valve. The expired air is collected in a Douglas bag and is measured by a gasometer in terms of liters. The normal value is 100 liters per minute for women and 150 liters for men.

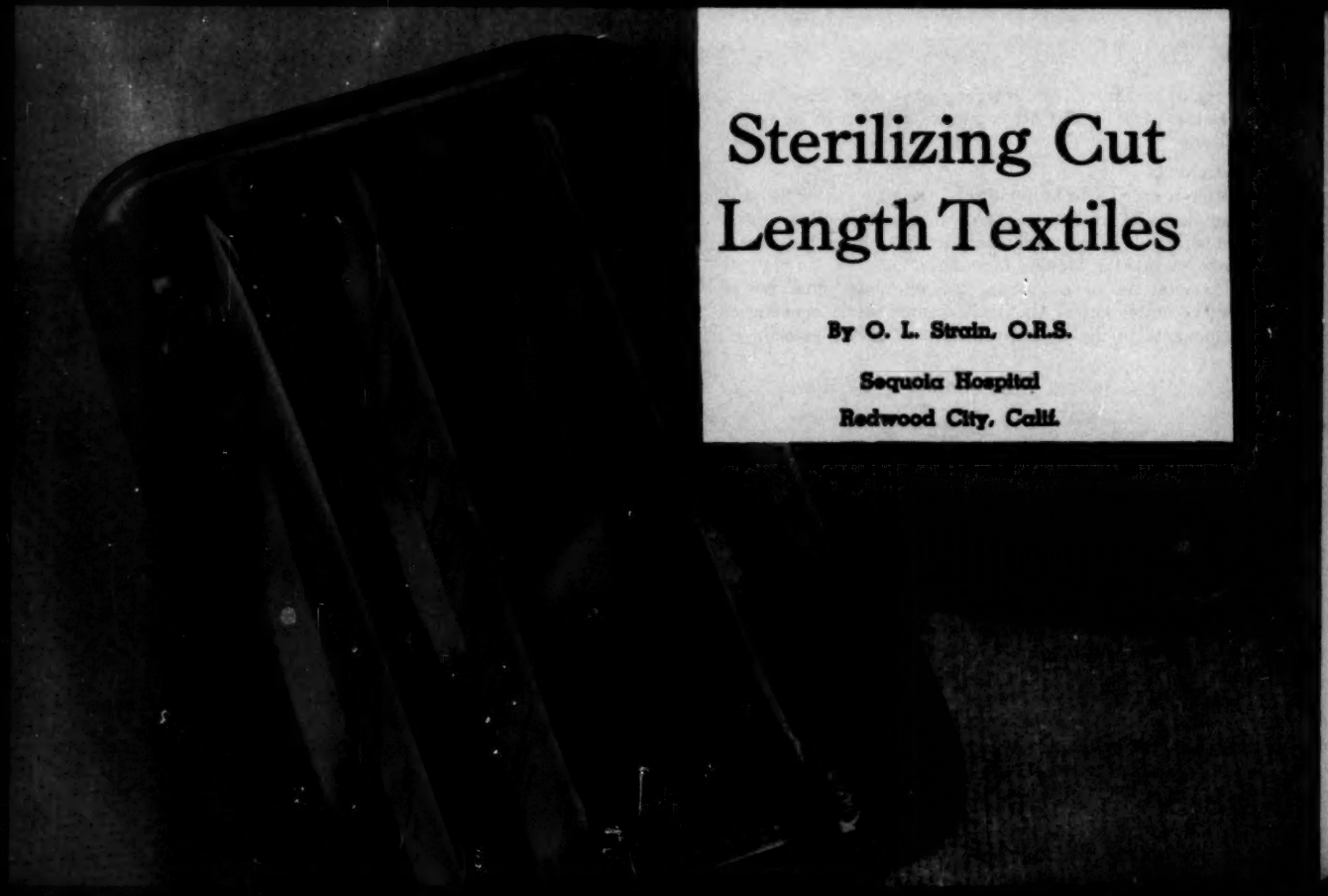
For the ambulatory patient, a walking ventilation test is also recommended.

For cardiac evaluation, a good physical examination is essential, with an electrocardiogram where indicated. Studies of low frequency heart sounds, those undetected by ear, are of value if an instrument for recording them is available.

One of the important problems in anesthesia is to develop ways and means of maintaining total peripheral resistance within normal limits. Thus, care in the selection of the anesthetic agent is essential, particularly where there is cardiac disease.

In addition to investigating the pulmonary and cardiac status of the patient, complete blood studies must be done. Hematocrit is important whether it be lowered or elevated. The higher the hematocrit the more viscid the patient's blood, requiring more work for the heart. Those with a hematocrit over 50 are not considered suitable for general anesthesia. Intravenous fluids will usually help the situation.

Where possible, total red cell and plasma volumes including values for total circulating protein should be obtained.



Sterilizing Cut Length Textiles

By O. L. Strain, O.R.S.

Sequoia Hospital
Redwood City, Calif.

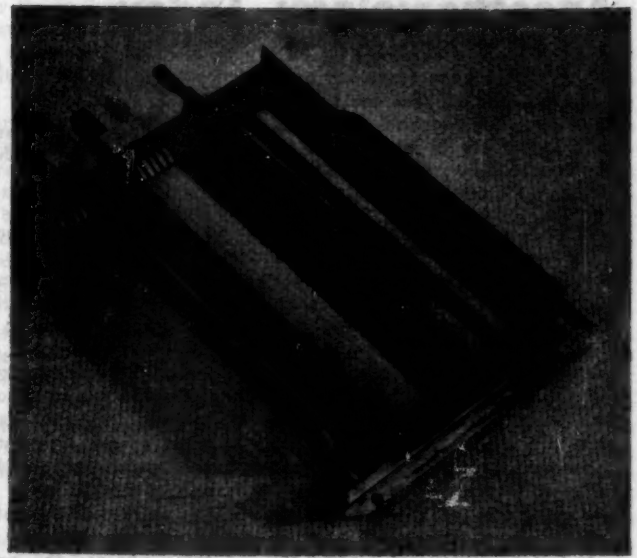
SINCE the introduction of cut length silk, cotton and nylon sutures, (Ethi-Pack), we have endeavored to devise some means that would facilitate the handling and sterilization of these packaged textile sutures.

With the assistance and ingenuity of our assistant surgical supervisor, Phyllis Biddleman, a rack was designed to hold these packages in such a manner as to insure contact with the sterilizing steam. This rack, made to fit a standard instrument tray, is removable for ease of cleaning and equipped with separators to easily identify the various sizes of sutures.

Advantages of handling these sutures in this manner are:

1. Elimination of waste motion.
2. Ease in readily identifying different sizes, and removing the same.
3. Assurance that each package has been sterilized.
4. Ease in replacing re-sterilized packages.
5. Elimination of waste through distortion of package.
6. Repeated re-sterilization without damage to package or sutures.

The rack is simple to construct. It is made from stainless steel angle iron with two strips acting as connectors in order to maintain the angle irons at the same length at all times. It is inserted into an 8 x 10 x 2 inch standard instrument tray on whose rim a ¼ inch rod of steel has been welded in order to keep cover from touching or contacting sterilized envelopes.



Anesthesiology Today

By Charles S. Coakley, M.D.

Associate Professor of Anesthesiology, School of Medicine, Chief of Anesthesiology, George Washington University Hospital, Washington, D.C.

THE rapid development of anesthesiology is a major factor in the tremendous increase in number and extent of surgical operations performed since the war. New anesthetic agents and new ways of administering them make possible many more operations to combat critical illness and to make people more physically fit.

Findings in anesthesiology also permit new methods of treatment with medicines and by inhalation procedures.

In fact, anesthesiology is now a full-fledged medical specialty. The modern hospital has established the Department of Anesthesiology to supervise its anesthesia activities and to train new specialists. The ultimate goal is a sufficient number of well trained anesthesiologists to insure comfort and safety to all patients.

The first function of the Department of Anesthesiology is its participation in the care of the surgical patient. This care is a coordinated effort of the internist, surgeon, and anesthesiologist. Each respects the opinion of the other and works for the welfare of the patient. The care of surgical patients is divided into three phases: the preoperative, operative, and postoperative.

Before their operation, many patients are apprehensive and likely to be confused by the necessary hospital routine. One of the duties of the anesthesiologist is to visit the patient before he goes to the operating room, usually the day before. During this interview, an attempt is made to allay apprehensions and to reassure him. The choice and conduct of anesthesia are discussed with the patient; and, if indicated, plans are made to start the anesthetic in his room. Premedication is ordered to meet the needs of the particular situation. The medication most often used is a barbiturate for its sleep producing effect, a narcotic for both its hypnotic and pain relieving action, and one of the belladonna group of

agents to suppress the undesirable reflexes of the parasympathetic nervous system. The dosage has to be individualized because it depends on many factors, some of which are the age of the patient, physical condition, amount of pain present, etc. In some patients not all these agents may be used. In surgical patients complicated by asthma, the use of avertin as the premedication agent of choice is preferable both for its hypnotic effect and the effect of dilating the air passages.

The anesthesiologist also reviews the history, physical examination and laboratory reports. Any diseases of the respiratory, cardiovascular, and urinary systems are carefully checked. Frequently, the anesthesiologist is the last physician to review these physical findings prior to surgery, and thus he has a better opportunity to discover peculiarities about the patient which may need special attention in the giving of the anesthetic or by the surgeon in performing the operation. Occasionally such conditions as diabetes may be discovered in patients not suspected of having the disease by the finding of sugar in the routine urinalysis. The preoperative blood count may reveal an anemic condition severe enough to require blood transfusion prior to or during surgery. A fresh head cold may have developed since the patient saw the surgeon which may necessitate postponing the operation. Usually the day before the operation the anesthesiologist discusses his observations with the other members of the team, the internist and the surgeon.

During the operation, it is the job of the anesthesiologist to produce the best operating conditions for the surgeon without altering the normal physiology of the patient. Any deviation from this normal, especially in the respiratory and circulatory systems, must be promptly recognized and proper resuscitative measures started. The use of the stethoscope and observation of the pulse are helpful but often inconclusive as to the status of cardiac action. In some of the more extensive surgical procedures, such as cardiac and pulmonary surgery, the use of the electrocardiograph during surgery has been very helpful in determining minimal early changes in the action of the heart.

The clinical observation of the color of the skin, mucous membranes, and blood have been helpful but can be inaccurate in determining the degree of oxygenation of the blood. Therefore, the oximeter, an instrument that is attached to the ear lobe and does accurately measure changes in blood oxygenation is used by the anesthesiologist.

The maintenance of fluid balance and blood replacement is likewise supervised by the anesthesiologist. Fluids lost either prior to or during surgery are administered into a vein during the operation. The development of blood banks has done much to advance surgery. Before the operation is started, blood is typed and crossmatched so that proper blood will be ready for that particular patient. The amount of blood prepared is determined by the amount necessary to bring the blood volume to a normal level plus the anticipated loss occurring during surgery. Blood is

Reprinted with permission from THE COURIER, Bulletin of George Washington University Hospital.

plied without charge by the Red Cross whose only request is that the family replace the blood at the Red Cross Blood Bank.

In the postoperative phase, the anesthesiologist visits the patient and checks for any possible complications. Many of these can be prevented; others, if treated promptly, can be minimized. The anesthesiologist's instructions to take deep breaths, turn frequently, and to clear airways by coughing do much to prevent complications. The postoperative use of oxygen, therapeutic nerve blocks for pain relief, and aspiration bronchoscopy to clear the respiratory passages are all functions of the Department of Anesthesiology.

During the past year at The George Washington University Hospital, 9267 anesthetics were administered for surgical and obstetrical procedures. All types of anesthesia make up this group. These consist of intravenous, inhalation, spinal, regional nerve blocks, and topical anesthetics.

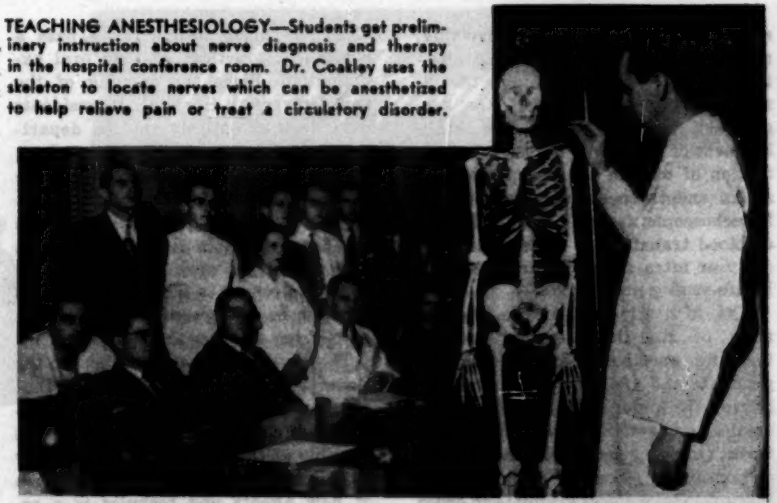
Sodium pentothal, an intravenous anesthetic is used in the majority of our patients. It is a pleasant, easy way to go to sleep and for this reason is used with other types of anesthesia. Most patients are given sodium pentothal prior to the administration of an inhalation anesthetic with which you are familiar as a gas breathed from a face mask. Many spinal and local anesthetics are supplemented by small amounts of sodium pentothal.

The large number of extensive surgical procedures being done by our surgeons in the fields of neurological, thoracic, plastic and tumor surgery have increased the responsibilities of the anesthesiologist. These procedures are frequently lengthy and done in positions where access to the air passages may be difficult. To insure a safe anesthetic, an endotracheal tube is used. This is a rubber or plastic tube placed in the windpipe and connected to an anesthetic machine. Thus the anesthesiologist has complete control over the respiratory exchange of the patient. The field of regional nerve block anesthesia has been developed to fill the gap of that group of patients where general anesthesia would be unsafe. A good example of this is the use of caudal anesthesia in the obstetrical patient with a premature baby. This choice of anesthesia eliminates any possible depression of the premature infant by the various drugs used for pain relief.

Giving of anesthesia is the primary function of the Department of Anesthesiology, but a second important part of its program is the performance of therapeutic and diagnostic nerve blocks. Many of the pain problems are referred to the department for study. Some of these can be relieved by injecting a local anesthetic agent into the nerves supplying the painful area. Blocking of nerves supplying the blood vessels in areas where circulation is impaired sometimes helps by dilating the vessels in this area thus increasing the circulation to the particular part. These blocks are also helpful in determining whether or not a surgical operation needs to be performed. If the block produces a temporary relief of symptoms, then the surgical interruption of these nerves will offer a more prolonged or permanent relief. Thus the

patient may be saved a surgical procedure if this block does not afford relief.

The third function of the Department of Anesthesiology is the direction of all inhalation therapy. The latest developments in oxygen therapy techniques and equipment are available at the George Washington University Hospital. Equipment such as an iron lung, oxygen tents both for adults and children, premature infant bassinettes with piped in oxygen, nebulizers for the inhalation of various medications, nasal and oral oxygen outfits, etc., are installed and maintained by two trained oxygen technicians under the supervision of the Department of Anesthesiology. An average of 33 inhalation therapy units are used daily throughout the hospital. Any postoperative patient whose oxygen demands are increased are given oxygen therapy of some type. Some examples of this group would be reduction of pulmonary function; such as, following chest surgery, limitations of cardiac reserve as in those patients with coronary artery disease or heart failure, and conditions such as toxic thyroids or febrile conditions where the increased metabolism demands more oxygen.



TEACHING ANESTHESIOLOGY—Students get preliminary instruction about nerve diagnosis and therapy in the hospital conference room. Dr. Coakley uses the skeleton to locate nerves which can be anesthetized to help relieve pain or treat a circulatory disorder.

Medical patients with reduction in blood oxygen are given oxygen. Into this group fall those patients with pneumonia, heart conditions, drug poisonings, etc.

The fourth function of the Department of Anesthesiology is that of resuscitative procedures throughout the hospital. Any depression or interference with the normal physiology of respiration or circulation demands prompt and definitive treatment. For such conditions as shock, obstructed

air passages, barbiturate poisoning, asphyxia neonatorum, etc., the anesthesiologist is always available to consult with the medical man, the surgeon, or the obstetrician. The establishment of an airway for the administration of oxygen by such procedures as an endotracheal tube, catheter or bronchoscopic aspiration, and the use of blood transfusions either intravenously or intra-arterially are frequently life-saving procedures.

The fifth function of the Department of Anesthesiology is that of teaching anesthesiology to both the graduate and undergraduate students. During the junior and senior years, the medical students are given formal lectures, informal seminars, and clinical clerkships in anesthesia and oxygen therapy. The medical graduate in order to qualify as a specialist in anesthesiology must complete a year's internship, two years of residency training in an accepted training program, and three years in the full time practice of anesthesiology. To become certified by the American Board of Anesthesiology, he must satisfactorily pass a written, a practical, and an oral examination. Since the opening of the new University Hospital, 12 residents have trained entirely in this department and 7 residents as affiliates from Massachusetts General and Veterans Hospitals received part of their training here. At the present time there are 6 residents in training. For the past 5 years, a week's intensive postgraduate course in anesthesiology has been given each year to anesthesiologists from all over the country.

The sixth and last function of the Department of Anesthesiology is that of research. Both laboratory and clinical research programs have been made possible at the University Hospital by various research grants. Investigation of new agents and technics is a responsibility that all teaching programs must accept. Some of the programs carried on have been: a study of the effect of various inhalation agents and technics on the lungs, investigation and introduction of a synthetic muscle relaxant which has safely reduced the amount of ether previously used, and a new intravenous anesthetic.

During the past year, clinical investigation of "Syncurine", a synthetic muscular relaxant, has shown it to be safer and just as effective as the curare preparations. Muscular relaxation, which is essential to good surgery, can be obtained without the use of large amounts of ether. Thus many of the unpleasant effects of ether have been eliminated. Some of these are the delayed recovery time and the nausea and vomiting that sometimes follows an ether anesthetic. "Syncurine" has been used and carefully observed in over 1200 cases without any ill effects. At the present time investigation of other muscular relaxants is in progress.

The functions of the present day Department of Anesthesiology far exceeds that of pouring ether. To meet these needs, adequate professional personnel must make up the anesthesiology staff.

New Products

New type cap that covers the hair completely, keeping it snugly in place is designed for operating room nurses. It is made so that it cannot be worn back of the head like a turban; to stay on it must be worn across the forehead, keeping the front lock of hair from being exposed. Made of lightweight muslin, strongly stitched, it is easily put on. Available with elastic band in the back or with a drawstring.
American Hospital Supply Corp.

Ether-vapor and vacuum apparatus is simple to operate, keeps the patient constantly anesthetized with an even, uninterrupted, controlled flow of ether vapor. Simultaneously it maintains a powerful vacuum for drawing off blood, pus and mucous from the operative field. It has a ¼ H.P. explosion-proof motor approved by Underwriters' Laboratories. The power plant is completely enclosed.
V. Mueller & Co.

Patient Safety in the Operating Room

A talk given by Dr. Carl Walter, assistant professor of clinical surgery, Harvard Medical School and associate surgeon, Peter Bent Brigham Hospital Boston, before the Boston O. R. group.

Let us devote this discussion to the design of an operating room, attempting to emphasize patient safety from many aspects which is what we are primarily interested in. Not patient safety as Semmelweiss once thought of it. He was happy if he could save 75% of the patients in his hospital; the other 25% were considered as inevitable casualties. We are interested in saving 99% of the lives in surgery, and we are displeased when even one or two wound infections or even a 1% mortality result. Our attention in the last 25 years has been focussed upon decreased morbidity and mortality in spite of the fact that we operate on older age groups and do more extensive surgery on the most vital organs. Because we have found out how to prepare the patient for surgery more adequately and

● A HIGHLIGHT of the annual A.M.A. convention in Atlantic City was color television. Part of Philadelphia's Pennsylvania Hospital moved bag and baggage to Atlantic City Hospital to star in the daily programs. Under the guidance of Dr. C. Alexander Hatfield, 14 surgical procedures and 20 clinical procedures were televised.

how to minimize the trauma, the patients come through. It might be well to design an operating room tonight from a new, fresh point of view and show you that it can be simplified if we think of function and function alone.

THE SURGEON

Usually the first concern in operating room design is the surgeon. He should be the *last* consideration. We should think first of the patient and second of the nurse who works long hours and only third about the surgeon, who is at best a part time worker. His job is concerned chiefly with anesthesia, position, illumination, comfort, and service. The nurse's job is basic in scope and concerns housekeeping, supplies, sterilization, assisting, circulating, traffic control, terminal sterilization, etc. Her job deserves a great deal of analysis to the end that the optimum environment is created for the surgeon. We should try to save time and effort and, at the same time, design safety and economy into the operating room.

The focus of attention is on the patient's wound where we want prompt kind wound healing in an incision inches long. Except for this fact, there would be no need for aseptic technic. Many surgeons think that antibiotics make it no longer necessary to espouse aseptic technic. That may seem to be true in many instances, but bacteria learn how to live in penicillin. Those who work in a surgical bacteriology laboratory or work with surgical problems realize that the surgeons who put all their faith in antibiotics are in for a very sad disillusionment because just as the gonococcus became resistant to the sulfonamides so are organisms becoming resistant to penicillin. Five years ago a patient with severe staphylococcus infection came in for penicillin therapy and recovered. Today, it is unusual to find one who will respond because of resistance of these organisms to penicillin. Antibiotics are good and should be used where indicated but should not be given prophylactically because they defeat their own purpose. Unfortunately, this abusive use of antibiotics has encouraged surgeons to ignore or circumvent aseptic technic.

Proper asepsis of a wound, less than .01% of an operating room in volume, concerns many factors in the operating room. First, size and shape of the room are important. A patient normally has a pair of feet and legs and when recumbent a tall patient requires a table roughly 6 feet 5 inches long and 2 feet wide. If the patient is anaesthetized, the anaesthetist sits at the patient's head with a machine at his side which is necessary to confine the flammable gas and to keep the patient anaesthetized safely. We then have the surgeon, assistant, a nurse or two, any or all of whom may be obese, a glove basin, a portable light, instrument tables, and probably a kick pail. These essential elements occupy an area roughly 10′ x 10′. Everything in the functional area concerns the anesthetic and surgical care of the patient and the prevention of sepsis in his wound.

CIRCULATING NURSE

As the operation progresses, the circulating nurse is called upon for more instruments, supplies or drugs to the sterile field, so we must provide a corridor around the sterile area. Even a thin nurse requires roughly 3 feet to maneuver in this corridor,

GROUP OF OPERATING ROOM SUPERVISORS and nurses who attended the course in aseptic technic given by Dr. Walter at St. John's Hospital, Santa Monica, Calif., March 19-24, attentively watch a demonstration.

DR.. WALTER DEMONSTRATES a technic using Miss Dorothy Wysocki, his assistant, as a model. The group was able to watch closely and ask any questions.

particularly when equipment must be shifted or a change in posture is requested. Thus the operating room gets to be 16' wide. You allow a 3' corridor at the foot end, 5' at the head, and you come to a space 16 x 18 feet as a minimum for an operating room. I would like to remind you that it makes little difference if you have a patient with his thorax open from front to back or one with a wen being excised,—a recumbent patient occupies space and the aseptic technics for minor surgery are the same as those for major surgery and often more critical as in a tendonorrhaphy, for example. A patient can die from an anaesthesia accident during the drainage of an ischio-rectal abscess as well as during a mitral commissurotomy. A big concept you should have is that there is no such thing as minor surgery. Surgery takes space and equipment. The patient is the big core and you cannot shrink this functional area without encroaching on patient safety.

The corridors about the aseptic field are for purposes of getting supplies to the field. There should be some source of sterile supplies, basins, sponges, gloves, etc. It is usually best to have a cabinet for a day's supplies built into the corridor end of the operating room at one side of the door so that they can be replenished and reached with a minimum of foot steps. On the other side, put a cabinet for unsterile supplies, small equipment, emergency drugs, suture jars, etc. so that the circulating nurse need not leave the room for this kind of equipment. The cabinets should have no doors. Supplies are seen quickly and reached without the clatter of doors or the raising of dust incidental to opening and closing them.

Access to the operating room should be through ordinary double acting doors, double hung, which open into the operating room and corridor as well. Dividing an ordinary big door into two gives more useful space than if you have a large door which sweeps into the room and occupies space.

Another thing you need which comes up very soon in the course of a procedure is adequate illumination. If you have a good team and a good circulating nurse, there is nothing better than a ceiling suspended surgical light. It is in disfavor in many localities because we forget to position the patient first and then arrange for good light and instead drape him first and then struggle for light. You do not need fenestration; a simple row of glass blocks to let in light for general illumination is adequate.

VENTILATION

Ventilation is important to control humidity and temperature for comfort. Humidity should be kept around 50%. This contributes an important item to the safety of the patient and that is a rapid die-away of air borne bacteria. In a dry atmosphere, bacteria settle out more slowly than in rooms where the relative humidity is more than 50%. The temperature should be maintained at 70° and that is only for the comfort of the surgeon and team. It prevents excessive perspiration and hence prevents skin bacteria from seeping through gowns. It has no effect on the patient who is covered with blankets and drapes and whose rectal temperature accordingly rises. A relative humidity of 50% is easy to attain in Boston during spring and fall; but is difficult in winter because of steam heat. In summer 50% is exceeded and discomfort from the mugginess results. For that reason, air conditioning is used in new hospitals. In an old building, it is more practical to install a small package unit to control humidity

and temperature in each room. It is usually more successful and less costly than an elaborate duct system built as a compromise in an old building.

Three quarters of the air in the operating room can be recirculated safely; 100% fresh air is not economical. With a properly installed electrostatic precipitator to control dust, you need not fear air borne bacteria from this source. Many feel that humidity prevents explosions, but let me remind you that most fatal explosions occur in the naso pharynx of the patient where the humidity is 100%. Humidity does little to prevent static discharge and ignition of flamable gases where the buildup of dangerous voltages is rapid. In operating rooms that are kept scrupulously clean and free of dust, diethylene glycol vapor can be used to control air borne bacteria.

ELECTRIC POWER

The next problem is one of safety for the patient as well as the nurse. That concerns getting electric power, anaesthesia gases, and suction to the operating table. Custom provides outlets scattered about the room. When the operation is in progress, there are many cords to the field and the nurses trip over them and have trouble moving portable lights, gas machines, etc. This can be obviated if there is a recognized area in the design of the operating room for locating these cords in one corner, out of the traffic lane. A cabinet for this purpose can be designed into an operating room. The corner cupboard motif forms a pleasing mount for the view box, panel for supply outlets and a cupboard for suction bottles and tube and cord storage.

When you design the power supply for an operating room, think of safety of two sorts,—prevention of electric shock, and elimination of danger of ignition by sparking and arcing. Electric power must be protected so that people cannot contact live wires. People perspire in the operating room — the anesthetized patient perspires freely; the surgeon is often excited or anxious; the nurse is on the "spot". Everybody is keyed up emotionally. The electrical resistivity of the skin is very low under such conditions and the amount of electric current it conducts so great that the individual is abnormally susceptible to electric shock. Ordinary 110 volt, 60 cycle current causes ventricular fibrillation and death in people whose wet skin makes contact to ground. There are deaths in operating rooms attributed to patients or nurses having "coronaries", which in reality result from electric shock. To be shocked severely, the person must have broad contact with a low resistance ground comparable to standing in a bath tub of water and touching a faulty light switch. Perspiration wet skin provides ideal contact with the ground and a break in poorly maintained electrical insulation provides the opportunity for current to flow through the individual. To minimize the shock hazard, the electrical system in the operating room is different than that in the average household. In a household electrical system, the power is stepped down to safe voltages by a transformer located on the pole. The power, at 220 volts potential, is connected to the house circuits by three wires. One of these is grounded by driving a copper rod into the ground and also connecting it to a water pipe. That grounds the center coil of the secondary winding of the transformer. Two hundred twenty volts can be obtained by connecting to the ungrounded wires from either end of the secondary winding. One hundred ten volts is obtained by

connecting either ungrounded wire to the grounded one. Hence, 110 volt household circuits have one wire grounded and contact with the live wire by a grounded person causes a shock just as contact between the bare wire and a grounded object will cause a spark. The power in the domestic circuit is controlled by a switch located so that it breaks the live wire and overload protectors, such as a fuse or a circuit breaker, are located in series with the switch.

In an operating room electrical system the power wires also enter the hospital with one of them grounded, and this power is supplied to the operating room. An isolating transformer is then inserted between the supply line and the operating room circuits so that the latter have no connection with the ground. In this system, contact between ground and a bare wire will cause neither shock nor spark. Chance sparks and shocks due to failure of insulation of contiguous spots on both wires are less frequent than where any single failure can cause an accident. Switches and overload protectors are arranged to break the circuit in both wires simultaneously so that the unused circuits are completely dead.

To protect the power circuits further, they are enclosed in a grounded conduit or a braided sheath and monitored by a ground contact indicator. The electrical portions of appliances are also connected to this grounded sheath or conduit. Accordingly, any break in insulation will permit contact with the ground and activate an audible and visual indicator located in each operating room. In this way faulty wiring or equipment is disclosed immediately and not at a time when it is being used in a hazardous location.

Switches and connectors used in the operating room are designed to prevent sparking and arcing which occur with domestic devices.

FLOOR PROBLEMS

Acoustic comfort is a factor often forgotten in the operating room. With a hard ceiling and a hard floor, anything dropped makes a terrible clatter. The room should be acoustically soft with a fiber glass ceiling or perforated transite ceiling, a polyvinyl dado and a soft floor. The floor must be conductive to electricity. It must have sufficiently high resistivity so that you can stand in your bare feet, touch a live wire and receive no shock. The floor contributes besides acoustic comfort, a soft, sanitary, non-slippery surface to walk on and electrical interconnection. It can also contribute optical comfort if it is gray, dark green or black to reflect light.

The floor introduces two problems in cleanliness — one is a vacuum cleaning system and the other is a mop. A vacuum should be used to clean the room daily. The exhaust should be discharged to the outside. It does little good to use a domestic type cleaner which scatters fine dust and bacteria in the air. In a new hospital, a system can be installed with a discharge to the outside, or in an old hospital, a portable industrial cleaner is available with the discharge to the outside. Besides being vacuumed every day, the floor must be mopped between operations with a clean germicidal mop. Facilities for cleaning the floor are important because the floor is a major part of every aseptic field.

STORAGE FACILITIES

Storage space is usually forgotten in planning an operating room. Both location and size are important to make this room useful. Equipment such as the cautery, Mayo stands, gravity poles, stools, carboys of germicides, etc., which are used in a pair of operating rooms can line the walls of a room 8 x 20 feet. Such a storage room should be provided in proximity to every pair of operating rooms because it is impossible to properly clean the floor of an operating room where the walls are lined with equipment which must be moved.

One sterilizing room can serve two adjoining operating rooms. The first item to mention is an essential bit of equipment for floor care, and that is the mop closet to house the mop used only in the operating room. The mop reaches the surgical field more often than most surgical instruments. It is estimated that 60,000 viable organisms per hour settle on an aseptic field in a clean room; that number rises to 2 to 3 million in a dirty room. In an operating room with a history of postoperative sepsis, reach down and wipe the floor with your hand — you can tell the whole story quickly. One solution is a clean mop, readily accessible and a proper place to keep it. The second requisite for floor care is a flushing rim service sink in which to clean the mop; make up germicidal mixtures; empty kick pails, etc.

BLANKET WARMER

There should be a blanket warmer to dehydrate the blanket which will then take in 20% of its dry weight in perspiration from the patient and keep him warm and comfortable. Flasks of solution also can be heated in this warmer. A dry heat sterilizer for cutting edge instruments can be mounted over the warming cabinet. An emergency sterilizer and instrument-washer sterilizer are conveniently located along the same wall. Cabinet models should be specified to avoid expensive recessing. The far end of the room is devoted to facilities for disinfecting hands; a pair of scrub sinks - stainless steel industrial sinks are excellent, a shelf for brushes, nail files, etc., and an arm soak.

Conductive flooring should extend everywhere anaesthesia is given. Ideally patients are anaesthetized in the operating room because wheeling the patient from place to place increases the hazard. If anaesthetized patients are moved, corridors must have conductive flooring because the motion of wheeling gas machines or tables through the corridor creates static electricity. The most hazardous period for explosions is when the patient is in respiratory difficulty because people rush to help him, and the motion generates static at such a rapid rate that discharge occurs.

The corridor in an operating room is considered a work space and not a passageway. Everyone in that corridor must be safe from the point of view of clean, non-static clothing, clean shoes, and masking. An interchange area is essential to isolate the operating room suite and to get patients and personnel into the operating room, and to filter out those who do not belong. A series of dressing rooms serve as the lock for personnel. Do not forget the attendants because they usually have dirtier shoes and clothing than anyone else. Visitors should be made to change their clothing and walk in their stocking feet which are usually cleaner than their shoes. This simple device often discourages visitors and encourages them to cut their stay short which is best for the patient and surgeon. Clothing worn in the operating room must be of cotton. Wool, nylon and rayon are potential

sources of hazard because the rate of static buildup is so rapid with these materials that sparking is hard to control with certainty. Shoes should have conductive soles and heels so that the wearer's moist feet are in contact. Shoes should be cleaned each time they are used to remove bacteria harbored in blood stains and dirt, which serves to insulate the sole.

ANAESTHESIA MACHINES

Anaesthesia machines should have conductive rubber parts throughout so that no part is electrically insulated from any other part. They should be easy to disinfect. Insides of masks and tubing should be routinely washed with calcium hypochlorite and should have non-interchangeable attachments for tanks. The furniture in the operating room must be made of unpainted metal with conductive castors to connect the furniture to the floor, or there should be heavy bronze sash chain drags to connect furniture to floor. Do not rely on conductive rubber pads on the operating table to interconnect the patient. Make sure the table has a conductive mattress so that motion of the mattress does not build up dangerous charges. A grounding strap of conductive rubber attached to the metal frame of the table must be thrown across the patient's bare skin to provide a conductive pathway to the floor. He is usually insulated from the mattress by the use of sheet or blanket.

WAXED FLOORS

I have tried to discuss explosion hazards with operating room design. I have done it on purpose because safety in this area must be designed into the operating room. If it is not, no amount of behavior will make the operating room safe. On the other hand, the best operating room design is frustrated if clean conductive shoes and safe clothing are not worn. Do not wax the floors in the operating room. Waxing puts an insulating layer on the floor. Test conductive equipment periodically. Shoes must be checked daily because dirt collects on the sole and serves as insulation. Enforce simple rules of conduct such as those on page 27 of Bulletin 56 of the National Fire Protection Association.*

QUESTIONS

Question: What is the best floor for the operating room?
Answer: Only three bear Underwriter's Laboratory approval at the moment:

1. Congoleum Nairn is good everywhere except in the obstetrical department, where amniotic fluid causes deterioration.
2. Trowelled plastic by Walter Legge.
3. Federal Flooring.

Operating room supervisors object to these floors because they are of dark color and because they are not made of tile. Actually, the dark color is highly desirable because it shows up the usual kind of dirt found in an operating room and is optically comfortable rather than fatiguing. All three are electrically conductive.

A Hubbelite conductive floor is also good but thus far unapproved. The floor you do not want is terrazzo which cracks and spawls, is unsanitary, noisy and slippery. Remember that between operations, the floors should be mopped in a solution of 0.5% Kleneg or 1-1000 calcium hypochlorite. Conductive waxes

* 25c from National Fire Protection Association, 60 Batterymarch St., Boston 10

are available but to my mind they are useless because operating room floors are not made to be looked at. They are intended for safety and so should be mopped often with good germicides.

If you have conductive flooring and everything is grounded, how do you ground the patient?

The blanket or sheet insulates the patient from the conductive mattress. What you do then is fasten one end of a conductive strap to the metal frame of the table and put it across the patient's naked chest or leg.

Is there any indication for moistening the plate under the patient when using an electrical machine?

No, the patient's skin is moist enough. Make sure the plate is flat under the patient because if there is a bump, a burn may result from the electric transfer which concentrates on the bump at the point of highest pressure.

Conductive Sole Shoes

These shoes serve to ground body static before it can cause a spark in anesthetic atmospheres. They conform to recommendations of the National Fire Protection Association and the A.H.A. They have a conductive sole and heel plus a conductive sock lining that insures grounding whenever one shoe is in contact with the floor.

THE VERTICAL DRAPE

By Esther Jewett, R.N.

School of Nursing
Asbury Hospital
Minneapolis

Formerly operating room supervisor,
Minneapolis General Hospital

THE staff at the Minneapolis General Hospital designed a special drape to be used with the Tower fracture table when an internal fixation of the head of the femur is being done.

Since numerous x-ray pictures are needed to determine the accuracy of the fixation, there is repeated danger of contaminating the operative field with the portable x-ray machine. Our vertical drape removes the danger of contamination by excluding the x-ray machine from the sterile field. This drape also permits the anesthetist to work without interference and makes it easier for him to manipulate the operating table.

The photographs here and on the following page describe the steps of the draping procedure; a pillow repsents the patients right hip.

(Reprinted from Feb., 1951, The American Journal of Nursing with permission)

Figure 1. Standards at head and foot of table support a wooden crossbar. After the area is prepar for surgery, the scrub nurse squares off the field with four towels and small Backhaus towel clig Small clips should be used throughout the draping procedure to decrease the amount of opaqu material that will be visible on the x-ray film.

Figure 2. Four regular sheets—81 by 108 inches—are needed to complete the draping. Before they are sterilized, the sheets to be used on the right and left side of the incision are folded lengthwise, then fan folded and marked for their respective sides. When draping for surgery, either the right or the left sheet may be draped first. The folded edge is placed next to the operative field. The top edge is thrown over the wooden crossbar and the circulating nurse secures it behind with unsterile towel clips. The top drape, before sterilization, is folded in half, then in fourths, and then fan folded. When draping for surgery, the scrub nurse measures off as much of this sheet as she needs for the sterile area, places the fold at the top edge of the field, and throws the remainder over the crossbar. The circulating nurse secures it in back with an unsterile towel clip. The last sheet is folded in fourths also and attached to the lower edge of the operative field. The four thicknesses are needed because of the large amount of drainage at this site.

Figure 3. The surgeons' stools are in place. The bayonet forcep attached to the cord shows the position of the electro-cautery, if one is to be used. The Burdick machine (not shown here) is placed at the head of the table and is draped into the field. The frame at the left keeps the x-ray cassette in place when a lateral view of the fixation is taken, thereby reducing to a minimum the exposure of the holder to x-ray radiation. The frame is draped by the scrub nurse with a sterile, double-thickness pillow case. (Ed. note: The Burdick machine should not be draped with the same drape covering the patient for reasons of safety. Similarly, the anesthesia machine should not be draped because of hazard of explosion.) Figure 4. A posterior view of the drape. When preparing the vertical drape for sterilization it is packed with the two side sheets on top, next the top drape, and then the bottom drape. When the pack is opened the sheets are in the correct order for arranging the vertical drapé.

Figure 3

Figure 4

DRAPE AND GUARD FOR FLUOROSCOPE

A DRAPE for the fluoroscope is illustrated in figure 87, 1 (below). It is designed to fit a stainless steel frame, figure 87, 2, that slides over the edges of the fluoroscopic screen to hold the drape in position and provide a guard to keep sterile fingers and instruments off the unsterile glass while the screen is manipulated in the dark.

The drawstring at x, figure 87, 4, is fitted into the groove at the closed end of the frame, figure 87, 4, 5, before it is forced into the groove along either side, figure 87, 6. The drawstring is pulled taut to spring the arms of the frame together slightly and is secured by a surgeon's knot, figure 87, 7. The wings of the drape are then overlapped across the center, figure 88, 8 and about one-third of the tail is folded over the wings, figure 88, 9. The square formed by this fold is then turned over on top of the frame, figure 88, 10, and the assembly is packaged, figure 88, 11 for sterilization in a muslin wrapper, figure 87, 3.

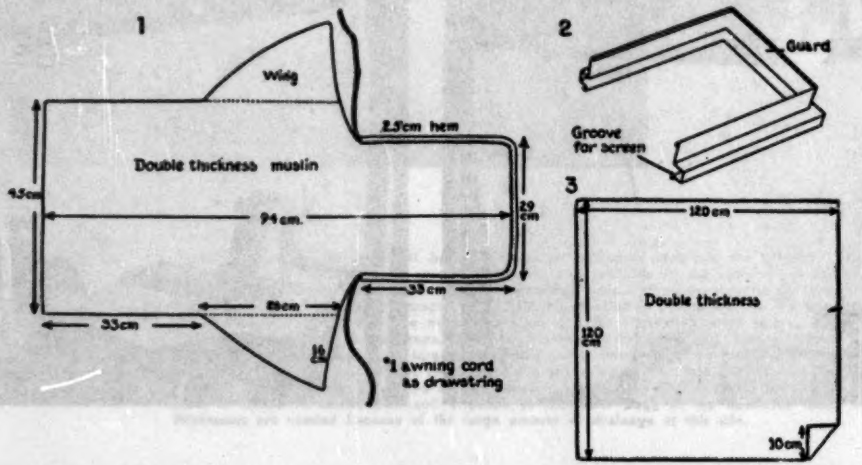


Figure 87

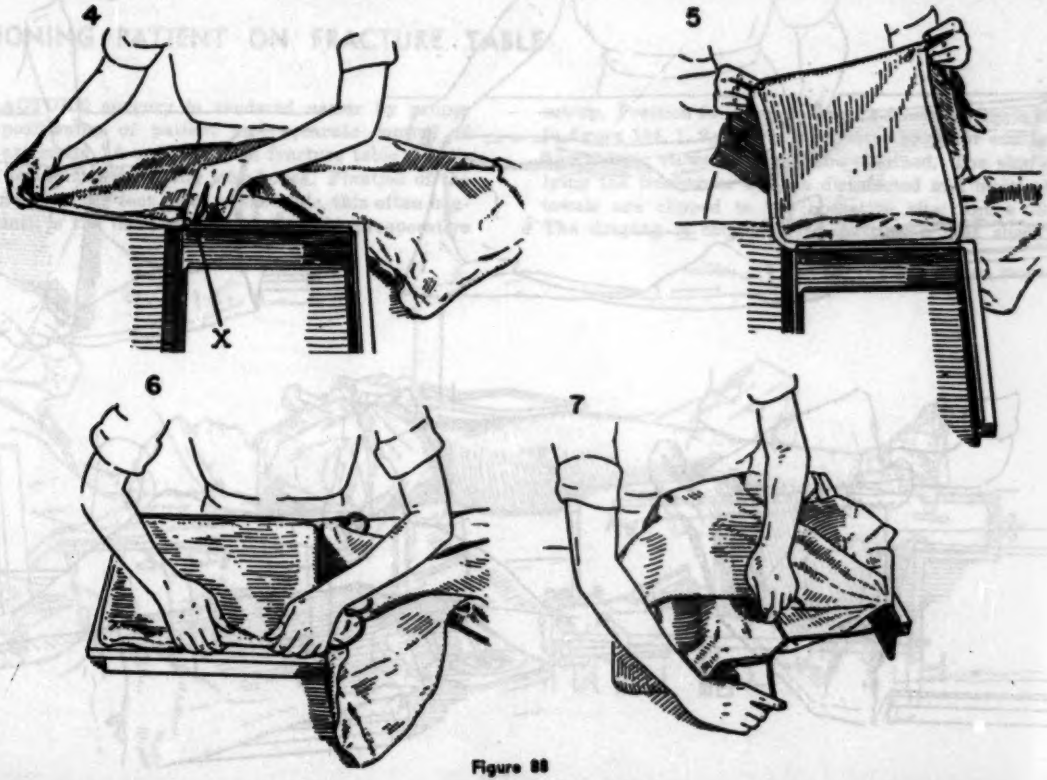
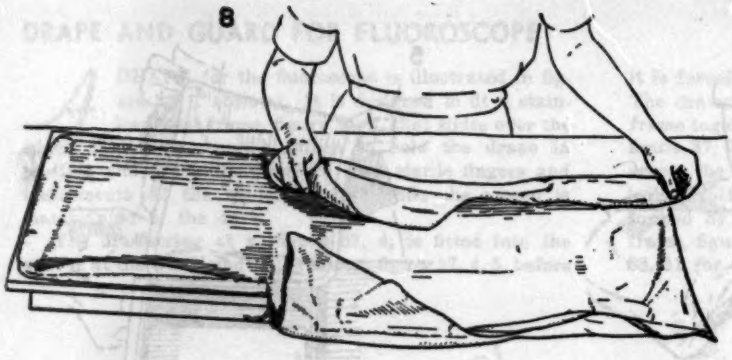
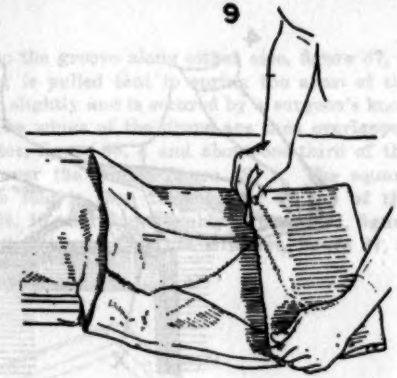
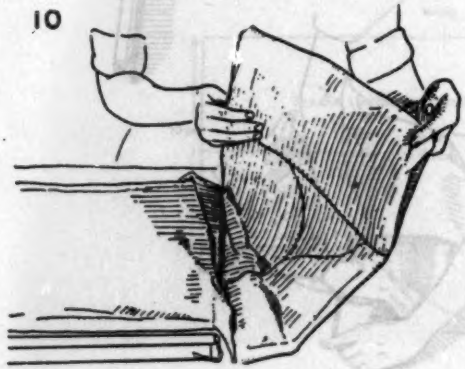


Figure 88


8


9

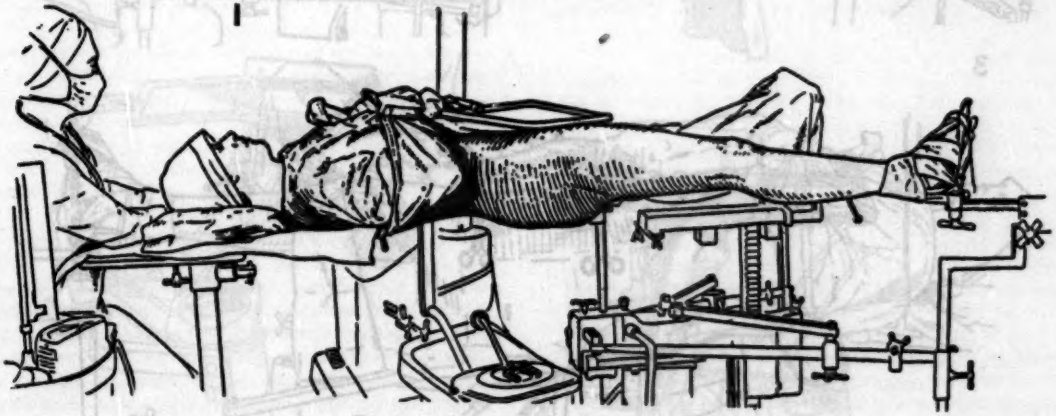

10

11

POSITIONING PATIENT ON FRACTURE TABLE

FRACTURE surgery is rendered easier by proper positioning of patient and accurate control of extremity. A well designed fracture table simplifies most procedures involving long bones. Fixation of the foot should be to the foot plate of the table, this often neglected detail, is the most critical part of the preoperative set-up. Position for fluoroscopy of a fractured hip is shown in figure 184, 1, 2, where both antero-posterior and lateral fluoroscopic views can easily be obtained. The skin overlying the trochanter is then disinfected and moist sterile towels are clipped to the operative site, figure 184, 3. The draping is completed by putting a half sheet over

(Continued on page 68)



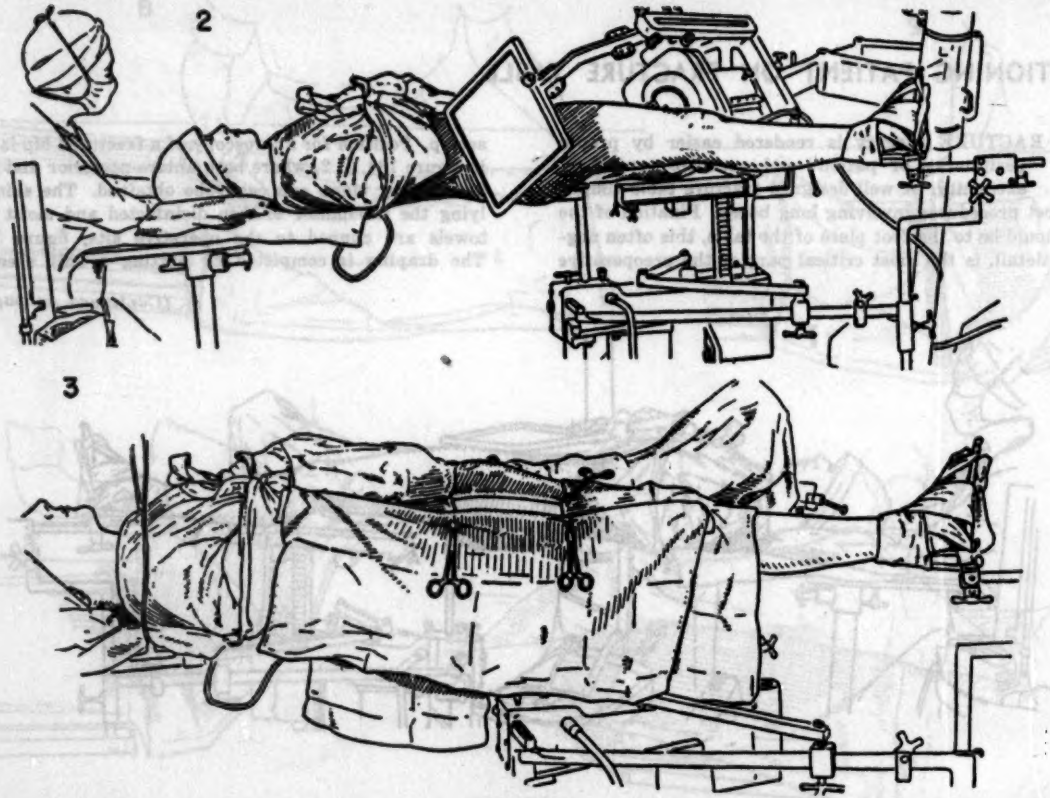


Figure 184

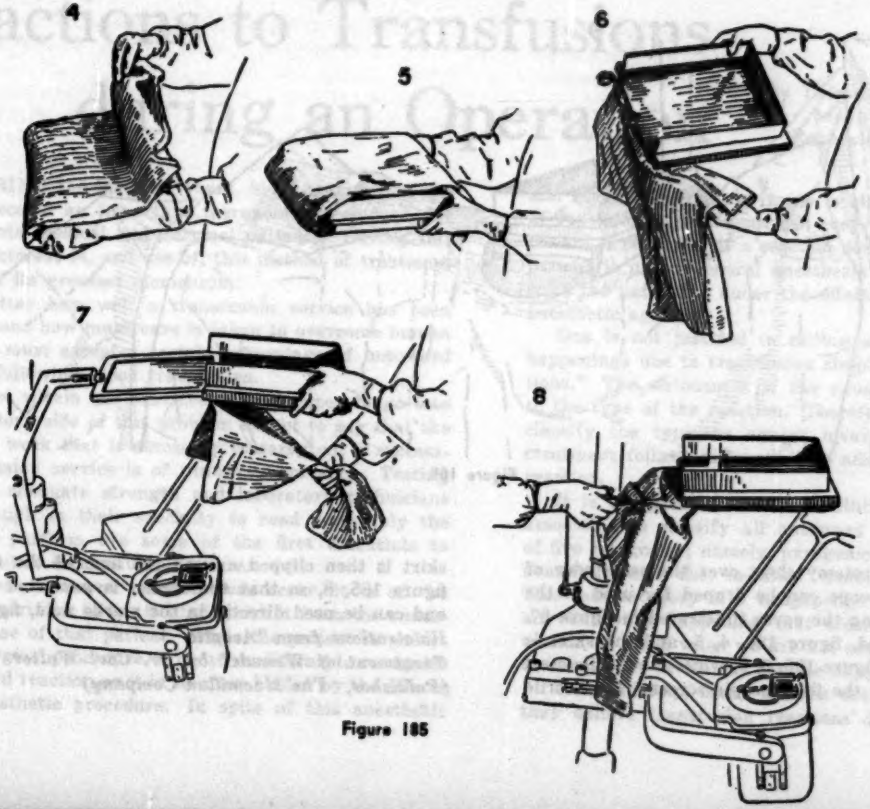


Figure 185

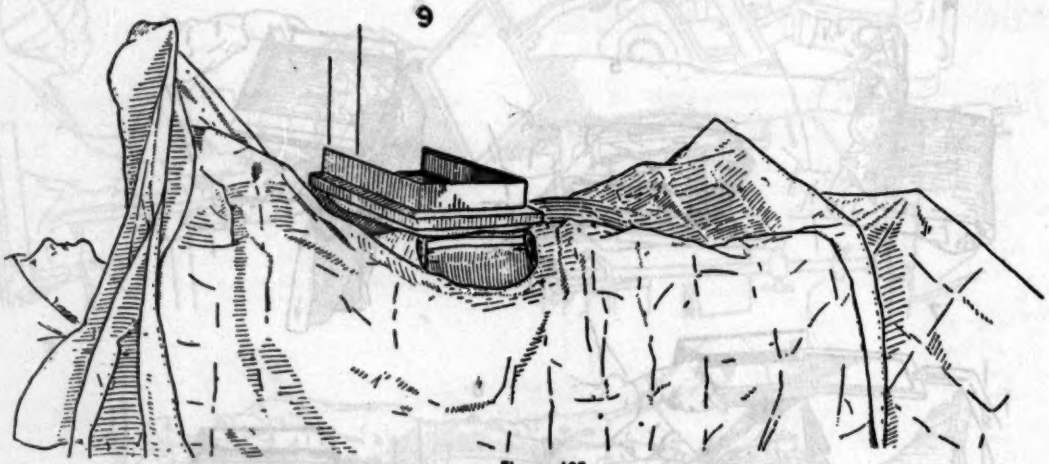


Figure 185

each foot and a laparotomy sheet over the remainder of the field. The fluoroscope can be draped for used in the sterile field by applying the cover illustrated in figure 87. This cover is unfolded, figure 185, 4, 5, and the skirt is held out of the way, figure 185, 6, 7, while the sterile steel frame is slipped over the fluoroscopic screen. The sterile skirt is then clipped around the arm of the fluoroscope, figure 185, 8, so that the screen is protected adequately and can be used directly in the sterile field, figure 185, 9.

Illustrations from "Aseptic Treatment of Wounds" by Dr. Carl Walter (Publisher, The Macmillan Company)

Reactions to Transfusions during an Operation

By Thomas H. Seldon
Mayo Clinic
Rochester, Minn.

DURING the last few years, blood transfusion has become an important therapeutic procedure, for both medical and surgical patients. During this time the interest in, and use of, this method of treatment has gained its greatest momentum.

No matter how well a transfusion service has been organized and how much care is taken to overcome human error, one must accept a certain percentage of untoward reactions following blood transfusion.

It is not within the province of this paper to go into the laboratory side of this problem except to say that the laboratory work that is necessary to carry out a successful transfusion service is of utmost importance. Testing serums of adequate strength and laboratory technicians skilled enough in their specialty to read accurately the tests they perform are some of the first essentials to carrying out a successful procedure.

When an untoward reaction does occur, it is of the highest importance to try to distinguish it from the underlying disease of that patient. While the patient is undergoing a surgical procedure, it is rather difficult to recognize an untoward reaction as it is so often hidden by the effects of the anesthetic procedure. In spite of this anesthetic and surgical procedure, if one is alert to the possibilities of reactions, at times one can suspect that something untoward is occurring if a reaction does take place while the patient is under general anesthesia and almost certainly so if the patient is under the effects of a local or spinal anesthetic agent.

One is not justified in calling any and all untoward happenings due to transfusion simply by the word "reactions." The seriousness of the situation varies according to the type of the reaction. Therefore, one should try to classify the type, as almost invariably the subsequent treatment follows different lines according to the type of reaction.

It is the practice in the institution with which I am associated to classify all untoward happenings into one of five categories; namely, pyrogenic, allergic, circulatory, hemolytic and the so-called undetermined happenings. This last category is a hodgepodge into which we place any untoward happening that accompanies the administration of blood when we are not sure if the blood should or should not be blamed for the happening.

Unfortunately, many persons are misinformed in that they believe transfusion reactions do not occur when a

patient is under the effects of a general anesthetic agent. This is erroneous, as any type of reaction may be experienced by the patient who is under the effects of an anesthetic agent.

Pyrogenic Reactions

A pyrogenic reaction usually exhibits itself by a rise of temperature of 1° to 4° F. appearing during or immediately after the transfusion. The temperature rise usually lasts one to eight hours, and unless something intervenes the temperature returns to the level that existed before the transfusion. A simple rise of the temperature is usually of no great significance as the patient will have derived the usual benefit he is expected to obtain from the transfusion. It is true that it is sometimes difficult to distinguish this rise from the expected postoperative rise of temperature. However, ordinarily one should expect a greater rise of temperature if a pyrogenic reaction does occur. In the event one gets this greater than expected rise of temperature and the patient's condition otherwise is satisfactory, then it may be suspected that this rise is due to the effects of the transfusion. As far as a simple pyrogenic reaction is concerned, the patient usually is not greatly disturbed. If the patient is awake, some sedative such as codeine or morphine may be given. The rise in temperature is frequently preceded by a sudden chill and even marked shivering of the patient. This shivering may be seen occasionally when a patient is lightly anesthetized. For this chilling and shaking, heat is applied in the form of hot-water bottles, electric blanket or other warming devices.

If this reaction is severe enough it may be difficult to distinguish it at first from the beginning of a hemolytic reaction. However, a hemolytic reaction usually is accompanied by other more severe symptoms such as pain in the lumbar region, anxious expression of the face, cold, clammy skin and other symptoms of shock. If one suspects a hemolytic reaction, 5 cc. of blood is withdrawn into a tube containing 0.5 cc. of 6 per cent solution of ammonium oxalate and 4 per cent solution of potassium oxalate. After centrifuging, the supernatant plasma is examined for free hemoglobin. The patient with a pyrogenic reaction should not necessarily have free hemoglobin in the plasma, whereas the patient with a hemolytic reaction usually has considerable free hemoglobin in the serum within a few minutes of the transfusion reaction.

If blood is still being administered at the time of the occurrence of the reaction, its administration should be discontinued till the patient's general condition is evaluated and the type of reaction is determined. By at least temporarily discontinuing the blood the patient is not subjected to a greater insult in case the reaction is hemolytic in nature instead of pyrogenic.

Allergic Reactions

Allergic reactions usually manifest themselves by the sudden appearance of urticaria, hives or even angioneurotic

edema. This reaction may be accompanied by lumbar pain, dizziness and headaches. Many of these symptoms may be masked, but I have seen marked urticaria, hives and even laryngeal edema with the patient under general anesthesia. The exact cause of these reactions is not entirely understood. In many instances the donor and recipient can give no history of allergic manifestations. The same donor's blood does not necessarily give an allergic reaction in all recipients. The elimination of all donors having active hay fever or asthma seems to decrease the incidence of these reactions somewhat. Occasionally donors have ingested foods to which the recipients are allergic and the recipients react by exhibiting hives or other allergic phenomena.

In the event of an allergic reaction in a patient under the effects of an anesthetic agent, epinephrine may be administered subcutaneously or intravenously if it is not otherwise contraindicated. If given at the time the allergic reaction actually occurs, the antihistaminic drugs are of relatively less benefit than if they are given before the reaction occurs. If more severe symptoms are experienced, the treatment must be symptomatic.

In the event one is forewarned about transfusing a patient having such tendencies, one should (1) use a fasting donor and (2) administer antihistaminic drugs to the patient before the transfusion. An antihistaminic drug, as well as epinephrine if indicated, may be added to the bottle of citrated blood and administered continuously with the blood.

Certain patients seem to be so sensitive that it is almost impossible to transfuse them and not get symptoms. On occasion my colleagues and I have found that one can transfuse these patients with washed erythrocytes quite successfully. However, I suggest that when these cells are resuspended in saline solution they should be transfused soon after being resuspended because if left standing in saline solution the cells will tend to deteriorate in a few hours.

In spite of the allergic reaction, one hopes to get the usual therapeutic effect. However, some allergic reactions may be severe enough to produce a laryngeal edema that necessitates more drastic treatment such as the administration of oxygen or oxygen under pressure, or maybe even a tracheotomy. I am sure that severe allergic reactions of this magnitude lower the value of the transfusion to the patient to a greater extent than does the allergic reaction that is mild in nature.

Circulatory Reactions

Usually this type of reaction is seen in patients suffering from some chronic cardiac disease. It is due usually to the disturbance of the cardiac mechanism or pulmonary mechanism that results from overloading the circulatory system. Too rapid administration or the administration of too great a volume of fluids or blood may cause this type of reaction. It manifests itself by the appearance of right-sided heart failure, very rapid pulse, a drop of blood pres-

sure, sweating, pulmonary edema and cyanosis. No particular difficulty in diagnosis should be encountered, as the general physical condition of the patient is almost self-explanatory. When this complication makes its appearance, inhalation of oxygen under pressure is indicated and may be essential. The withdrawal of at least the same amount of blood as was administered is indicated. If this type of reaction occurs on the operating table, the patient's condition is frequently serious and may be fatal. Spontaneous recovery may occur. Other symptomatic treatment is in order.

Hemolytic Reactions

Hemolytic reactions may be the result of various causes: (1) administration of incompatible blood, (2) administration of too high-titered group O blood to a group AB, A or B recipient, (3) administration of hemolyzed blood or (4) intragroup incompatibilities or the fact that a patient with Rh-negative blood becomes sensitive to the Rh factor and receives Rh-positive blood.

A hemolytic reaction produces agglutination and hemolysis and results in a more or less serious transfusion reaction. The reaction at times may be so mild as to go unnoticed and at other times severe enough to result in a fatal outcome within a few hours. The reaction is usually manifested by sudden lumbar pain, cold clammy skin, shock, fall of blood pressure, rapid thready pulse, dyspnea, cyanosis and air hunger. If the shock is successfully treated, the next symptom usually is the appearance of jaundice within a few hours.

If this reaction occurs on the operating table, with the patient under general anesthesia, it is recognized with greatly increased difficulty. However, it has been interesting to me that on three occasions when incompatible blood was administered accidentally to an anesthetized patient, three different surgeons made much the same remark. Each in turn complained of the increased bleeding and oozing from the operative site and no one at the time suspected that incompatible blood was being administered. The oozing and bleeding were severe enough to be very difficult if not impossible to control.

In the event that the patient exhibits these symptoms, one may notice a short time later that there is a hemorrhagic tendency as indicated by oozing of blood from the transfusion site, gums, uterus or any skin incision recently made. If a sample of urine is obtained at this time it will usually be found to be dark in color with considerable free hemoglobin, but with few, if any, erythrocytes. A sample of blood withdrawn from the recipient at the time of the suspected reaction should show considerable free hemoglobin in the plasma.

If the reaction is so mild as to be unrecognized, it is possible that nothing will be suspected till some time later when it is discovered accidentally. However, in case of a severe reaction, an associated oliguria or anuria usually follows. The jaundice disappears in a few days. Apparently there is no simple relationship between the depth

of the jaundice and the amount of the blood administered. The nitrogenous waste products start accumulating, and some hours or days later uremic symptoms make their appearance. As the uremic symptoms develop, stupor, convulsions and coma will appear unless something intervenes to improve the patient suddenly. Generalized edema and purpura may appear. If diuresis suddenly commences, the prognosis is better. However, continued anuria is indicative of a poor prognosis.

Diagnosis.—Because this is the one type of reaction to be feared most, a fuller explanation of diagnosis is in order. As previously stated, the chills and fever may be mistaken as part of a pyrogenic reaction. On the other hand the uremic state may be so late in appearing that the possibility of a transfusion reaction may have been forgotten. In this event the cause of the death may be wrongly attributed to the particular illness of the patient. Occasionally it is very difficult to decide whether the death is due to incompatible blood or acute cardiac failure.

When a reaction follows a transfusion, a sample of blood should be drawn from the recipient to determine if there has been some hemolysis. It is important that the blood be drawn into a tube containing 6 per cent solution of ammonium oxalate and 4 per cent solution of potassium oxalate. A half cubic centimeter of this mixture is adequate for 5 cc. of blood. This must be done soon after the reaction, as the free hemoglobin disappears quickly from the circulation. If the sample is taken too late a wrong sense of security may be felt by attending physicians. It has been shown in animal experimentation that the maximal hemoglobin level in the serum is reached within one minute, then rapidly falls within the next few minutes to one half of its maximal level; within four to five hours the free hemoglobin entirely disappears from the circulation.

If too old or outdated stored blood has been administered or if the blood has been improperly handled, a reaction may or may not follow. There may be free hemoglobin in the patient's serum for two or three hours, then the red color of free hemoglobin changes to the deep yellow color of bilirubinemia and fades within twenty-four to forty-eight hours. These changes may occur without any other symptoms whatever.

A sample of urine passed after the transfusion of incompatible blood is smoky red owing to the hemoglobin. Oehlecker has stated that hemoglobinuria does not occur unless at least 60 to 80 cc. of blood is hemolyzed. The coincidental presence of blood in the urine due to metrorrhagia or hematuria should cause no confusion because in these conditions numerous erythrocytes will be found and anuria is not one of the complications.

A retest of the donor's blood and the patient's blood as to grouping and Rh factor should be made, and cross matching should be done; samples of blood from the donor's bottle of preserved blood should be used for this purpose. Through human error, accidental interchange and wrong labeling of the bottle may have occurred. If fresh blood cannot be gotten from the donor, one may be

able to observe that a less than average titer of *a* or *b* agglutinins in the patient's serum increases greatly in the next few days after the reaction. If the titer of either *a* or *b* agglutinins is lower than average but is higher than average a few days later, one would suspect that the patient has received some group A or B cells.

Pathologic Features.[1-4]—The exact mechanism responsible for the symptoms of a hemolytic reaction is not completely understood. Some of the incompatible erythrocytes are disposed of by phagocytosis, but in severe cases the donor's erythrocytes are destroyed by the circulating agglutinins. It is quite generally accepted that the renal symptoms may be caused by the fact that the hemoglobin released from the destroyed donor's cells is being deposited in the renal tubules. When the concentration of free hemoglobin in the serum exceeds a certain value, the free hemoglobin is passed out through the kidneys. The actual damage to the kidneys may be the result of (1) mechanical blockage of the tubules by crystals of hematinic acid and casts that interfere with the excretory function of the kidney. One must remember, however, that the number of actual tubules that are blocked as compared to the total number of tubules is quite small. Therefore, the author feels that simple mechanical blocking is not the only cause of the anuria. The damage to the kidneys may be due also to the fact that (2) the toxic substances produced by the hemolytic reaction may have a toxic effect on the renal parenchyma and also cause a spasm of the renal arteries that is followed by a reduced filtration pressure. It is thought possible that this arterial spasm may account for some of the lumbar pain. A very fine presentation of this whole subject has been made by Lucke. Trueta and his co-workers also have thoroughly discussed this problem.

Death following very soon after a severe transfusion reaction may be associated with multiple thrombosis. Those patients who survive a few days and have uremic symptoms experience coma and have renal changes, such as swollen edematous kidneys with degenerative changes in the epithelium of the tubules and brownish pigmented casts in the lumens of the tubules.

Treatment.—In a suspected or proved case of hemolytic transfusion reaction, one is faced with certain definite steps. If the transfusion is still being carried out, it is stopped. An attempt must be made to support the patient during the period of shock; the administration of known compatible blood or blood plasma is in order. Alkalinization of the patient may be done by use of sodium bicarbonate or 6 molar sodium lactate. Intravenous administration of 5 per cent glucose in saline solution or in distilled water, is limited to 2,000 to 3,000 cc. daily. Careful watch is taken to prevent overloading the patient with sodium chloride. It is desirable to promote the onset of diuresis if possible. The intravenous administration of too much fluid is not desirable in trying to produce diuretic effect. Aminophylline, concentrated human serum albumin, blood plasma and so on may be tried.

Undetermined Reactions

In this group go all bizarre untoward happenings which follow blood transfusion. One cannot necessarily say that

the condition is not due to the transfusion, but neither can one blame the event on the illness. In such an event, one must suspect the transfusion until proof to the contrary is obtained. Treatment of this type of transfusion reaction must, of necessity, follow symptomatic lines.

Conclusions

Blood transfusions are an important part of the physician's armamentarium to treat the patient. As Crile said forty years ago, "Judiciously employed, transfusion will surely prove a valuable, often life saving, resource; injudiciously employed, it will surely become discredited."

REFERENCES:

1. Bennett, W. A.: Personal communication to the author.
2. Crile, G. W.: Hemorrhage and Transfusion; an Experimental and Clinical Research, New York, D. Appleton and Company, 1909, 560 pp.
3. Lucke, Balduin: Lower Nephron Nephrosis (Renal Lesions of Crush Syndrome, of Burns, Transfusions, and Other Conditions Affecting Lower Segments of Nephrons). Mil. Surgeon. 99:371-396 (Nov.) 1946.
4. Mathieson, D. R.: Personal communication to the author.
5. Odel, H. M., Ferris, D. O. and Power, M. H.: Clinical Consideration of the Problem of Extrarenal Excretion: Peritoneal Lavage. M. Clin. North America. 32:989-1076 (July) 1948.
6. Oehlecker, F.: Die Bluttransfusion. In Hirschfeld, Hans and Hittmair, Anton: Handbuch der allgemeinen Hämatologie. Berlin, Urban & Schwarzenberg, 1934. vol. 2, pt. 2, pp. 1513-1592.
7. Trueta, Josep: Studies of the Renal Circulation. London, Oxford. University Press. 1917. 187 pp.

(Reprinted from Surgical Clinics of North America, 29:1129-1135 August, 1949.)

Note to Supervisors

If you are an Operating Room Supervisor and do not regularly see the O.R. Section, published monthly in HOSPITAL TOPICS, and are not now receiving HOSPITAL TOPICS personally addressed to you, send your name, the name of your hospital and its complete address to us.

We will enter a year's subscription to HOSPITAL TOPICS for your own personal use, with our compliments.

Note: The owner and publisher of HOSPITAL TOPICS, independently selects all material for the O.R. Section, with the guidance of Dr. Carl Walter and Miss Dorothy Wysocki.

Question Box

Each month questions on O.R. practice are answered by Dr. Carl A. Wuchner, Director of the operating room technician course at the University of Minnesota Hospitals, and Mary Mallon, Operating Room Supervisor, Minneapolis General Hospital.

Q. In reference to the use of painted furniture in a new operating room suite being constructed to meet insurance and National Fire Protection Association Standards are the following questions: can painted operative stools with painted tops to used; can instrument tables with a white enamel top and painted legs be used; can an O.R. table with a chrome top and painted base be used and can the O.R. tables and instrument tables be used providing conductive rubber casters are used?

A. Bulletin 56 of the National Fire Protection Association requires the use of unpainted metal furniture mounted on conductive castors or equipped with heavy bronze sash chain as a drag. The reason that paint is contraindicated is that it either acts as insulating material to prevent a conductive path throughout the furniture or some of the newer plastic paints actually cause an accumulation of excess static.

An operating table with a chrome top and a painted base is satisfactory. Such tables usually have a hard enamel paint baked on to the base.

It was the intent of the rules to rid the operating room of wooden tables, glass top tables and ordinary metal tables completely painted with material which would either insulate articles placed on their tops or create a hazard by causing static electricity to form when materials are dragged across their tops.

Q. Could you please give me the pre-operative eye preparation used in the operating room? We are prepared to use phisoderm, irrigate with normal saline, and paint the skin with aqueous iodine 2%. Is it necessary to remove the iodine with alcohol to prevent dermatitis from scotch tape used to secure eye patch?

A. I suggest that the patient being prepared for eye surgery be instructed to wash his face and eye lids with any of the soaps or detergents containing hexachlorophene (G-11) for a week prior to operation.

At operation, the skin should be scrubbed with 1-1000 aqueous Zephiran and the eye irrigated with the same solution. It is non-toxic and non-irritating to the membranes of the eye.

Q. Does a change in color of the "improved" germicides containing hexachlorophene indicate a decrease of efficiency?

A. The color represents excess hexachlorophene coming out of solution. It does no harm.

Q. Does evaporation of formaldehyde solutions change their efficiency?

A. Evaporation of the active ingredients occurs at a constant rate to a point where half the volume is gone. At that point, the volume should be replenished because germicidal power is decreased.

Q. Since polyethylene cannot be autoclaved or boiled, how do you keep it submerged in a container of germicide?

A. It means using a germicide of low specific gravity such as an alcoholic solution of a quaternary ammonium compound.

Q. What would cause burns on some infants who have their buttocks cleaned with aqueous Zephiran and ether where no cautery is used?

A. Ether vapor is highly explosive and will catch fire from the slightest static spark caused by moving the infant, taking off its blanket, etc.

Q. What is the specific name of the moisture-proof bags that are recommended for use in septic case technic and where and how may these be obtained? *S.T., O.R.S., Columbus, O.*

A. You can purchase 8 x 12 water-proof paper bags from: D. R. Munro Co., 289 Congress St., Boston, Mass.

Q. At the present time, I am using Bard-Parker Solution to sterilize sharp instruments as we have no dry heat facilities. I am very allergic to Formaldehyde and may be forced to leave the operating room on account of it. Is there any other solution I can safely use? *C.E.M., Peekskill, N.Y.*

A. You can use your steam sterilizer as a means of dry heat sterilization for cutting edges by turning the steam into the jacket only and leaving the instruments in overnight. Lacking a steam sterilizer, you can use any one of the quaternary ammonium compounds with a corrosion inhibitor added. Be sure that your instruments are clean, free from grease and dry when put into soak. The time is 30 minutes for vegetative organisms and 18 hours for spores.

Q. How should one sterilize anaesthetic equipment, such as breathing tubes, following surgery? *W.L., O.R.S., Tacoma, Wash.*

A. Anaesthesia equipment such as masks and tubing are best deodorized and disinfected by scrubbing with 1-100 sodium hypochloride solution. The inside of the tubing should be flushed through with the same solution and then rinsed with tap water.

Suture Materials And Their Uses

By I. Mims Gage, M.D., F.A.C.S.* and Champ Lyons, M.D.†

PRECISE hemostasis and coaptation of wound edges are essential to sound wound healing. All surgeons recognize the necessity of utilizing suture materials to achieve these ends. Unfortunately, the use of suture material in a wound is a direct violation of an established surgical principle against incorporation of foreign bodies in wounds. An inflammatory reaction is an inevitable consequence of foreign body implantation. The very technic of ligature implies the implantation of a foreign body and in addition leaves within the wound varying amounts of devitalized tissue. High frequency coagulation is so productive of tissue necrosis that it cannot qualify as a nonsuture method for hemostasis. It is to be regretted that human ingenuity has not developed a nonsuture technic for the control of hemostasis and the coaptation of wound edges.

From the Department of Surgery, Tulane University Medical School, and the Section on Surgery, Ochsner Clinic, New Orleans, La.

**Professor of Clinical Surgery, Tulane University; Senior Surgeon, Touro Infirmary; Surgeon, Foundation Hospital; Consulting Surgeon, Illinois-Central Hospital; Visiting Surgeon, Charity Hospital, New Orleans.*

†Associate Professor of Surgery, Tulane University; Surgeon, Foundation Hospital; Visiting Surgeon, Charity Hospital, New Orleans.

ABSORBABLE VS. NONABSORBABLE SUTURES

Since the time of ancient Egypt surgeons have been concerned with both the technic and choice of material for suture. Modern surgery finds specific uses for both absorbable and nonabsorbable sutures. Catgut remains the universal choice for an absorbable suture. A greater variety of nonabsorbable sutures is in current usage. Silk is the animal product of choice. Cotton is the vegetable fiber of choice. Nylon is probably the most widely tested of the plastic products for buried sutures. Both steel and tantalum wires have strong advocacy.

As in any biologic experiment, the problem of comparative evaluation of these suture materials has been com-

plicated by the presence of multiple variables. Most important are the amount of tissue trauma, the degree of bacterial contamination, the integrity of hemostasis and the amount of tension employed. In the avoidance of tissue trauma gentle handling of tissues alone cannot compensate for the damage done by undue exposure of the wound to the drying influences of the atmosphere, the use of strong antiseptic or irritating antibacterial agents or dissection with dull instruments. It is now quite generally recognized that technical perfection in wound management is more important than the choice of a suture material as a determinant of optimal wound healing. The descriptions of wound healing by Moynihan attest the validity of this contention.

Students of the histology of wound healing have come to recognize optimal healing as "dry" healing. The aseptic inflammatory changes so characteristic of the dissolution and absorption of devitalized tissue, hematomas and foreign bodies are classified as "wet" healing. The survival and growth of bacteria within the wound leads to wound suppuration. The distinction between the aseptic inflammatory changes of wet healing and established wound suppuration has clinical importance in relation to the time required for ultimate wound healing. The technical objective, however, must be for dry healing because of the greater likelihood in the wet wound of the survival and growth of bacterial contaminants.

Catgut sutures constantly give rise to an inflammatory reaction resulting in the absorption of the catgut. The method of absorption is the same as for devitalized tissue. The process of wet healing delays fibroplasia and dissolves the fibrin which cements and fuses apposing wound edges. Impaired wound healing and dehiscence with sudden wound rupture or delayed incisional hernias are consequences of the extremes of this process. When catgut is replaced by nonabsorbable sutures, there is less demand for lytic enzymes and lessened incidence of hernia and wound separation. As has been emphasized above, however, it does not follow that dry healing is a constant accompaniment of all programs of wound management utilizing nonabsorbable sutures. The increment of advantage attributable to nonabsorbable sutures may be lost through neglect of the principles of tissue handling.

WHIPPLE STUDIES PROBLEM

The fact remains that the use of nonabsorbable sutures has been demonstrated to possess virtue in many clinical trials. Whipple studied this problem assiduously over a period of many years. He recognized that meticulous handling of tissues lowered the incidence of both trivial and serious wound infection regardless of the suture material used, but the incidence of wound infection was always considerably less with silk than with catgut. It is further apparent from these studies that the incidence of trivial infections with catgut *after* a refined technic had been adopted was four times as great as the incidence with silk *before* improvements in technic of wound handling had been generally adopted. Subsequent studies in many clinics have amply confirmed these conclusions. It has even been demonstrated that silk is less productive of suppuration in the contaminated wound than is catgut

(Shambaugh and Dunphey). Although it be recognized that meticulous care in the handling of tissues is of greater clinical importance than the choice of suture material, it cannot be denied there is ample justification for the ever-widening use of nonabsorbable sutures.

American surgeons have been led to the adoption of nonabsorbable sutures largely by the observations of Halsted and Whipple upon silk. However, there has been a constant search for a better nonabsorbable suture than silk. As a result of experimental and clinical observations extending over a period of approximately ten years, the Tulane School of Surgery has a decided preference for the use of fine cotton sutures. There can no longer be any question that cotton incites less inflammatory response than silk in wounds. The adaptability of commercially produced cotton thread to surgical purposes represented an economic advantage. Recently, however, the variability in tensile strength of commercial thread has become so marked as to constitute a cause for annoyance. If this defect continues, it may happen that cotton sutures will become as costly as silk.

USE OF NYLON ATTRACTIVE

The use of nylon was attractive because of the high tensile strength of fine threads. We believe that nylon tends to stretch and that the integrity of the ligature and the security of the knot are open to question. Further, nylon is apt to prove unsatisfactory because of the occasional occurrence of sensitivity to the plastic material.

Undoubtedly there is less inflammatory reaction to steel or tantalum wire than to any other available suture material. Even though it is practically inert in tissues, it has many objections. It is a bulky suture and difficult to handle, with the result that considerable attention must be devoted to the avoidance of tension. Secondary surgical intervention in a wound previously sutured with wire is open to objection because of the likelihood of puncture wounds to the surgeon's gloves or fingers and the dulling effect upon sharp surgical instruments in contact with metallic sutures. Radiopacity is another undesirable feature. It is believed that these objections are contra-indications to the routine use of wire for all purposes but are not sufficiently great to prevent its use for special purposes.

There should be general agreement with the conclusion that the use of nonabsorbable sutures with strict adherence to the principles of gentle handling of tissues will lead to the greatest incidence of dry wound healing. It is of some importance that for years plastic surgeons, ophthalmologists and neurosurgeons have advocated the use of nonabsorbable sutures. Attention to these technical details is essential to success but will not compensate for neglect of problems in nutrition or general physiology important for the ultimate integrity of wound healing. It should be recognized that all types of sutures retain a usefulness for specific situations in the hands of individual surgeons.

OUTLINE OF SUTURE PRACTICE AT TULANE

Isolated opinions as to indications for the use of various

sutures are interesting topics for discussion but hardly the basis for major controversy. The following broad program currently guides the usual practice of the surgical group at Tulane.

Closure of Abdominal Wounds.—Interrupted cotton sutures are used for the closure of all layers, including the peritoneum. Everting mattress sutures are preferred for the closure of the peritoneum in vertical incisions, but simple closure is usually practiced in transverse incisions. Through and through retention sutures are not used to reinforce a layer closure. In general, retention sutures are used only for the closure of wounds in debilitated patients and after wound dehiscence. Various technics have been tried to avoid wound dehiscence, but no method of suture has completely obviated the problem. The most important factor in the current low incidence of wound dehiscence appears to have been the adoption of the transverse incision in the upper abdomen.

Facial Suture.—The many advantages of interrupted nonabsorbable sutures in the repair of hernias have led to their adoption for all instances of fascial approximation. This principle has found such advocacy that interrupted cotton sutures are now used routinely in the repair of episiotomy and perineal relaxation in the department of obstetrics and gynecology. It is especially desirable to have minimal reaction and maximal tensile strength in sutures placed in collagenous tissues. Bunnell's wire pull-out suture for certain types of tendon repair seems especially sound. The use of nonabsorbable sutures in the repair of bone has been largely replaced by bone grafts, screws or plates because of the improved fixation afforded.

Hemostasis and Blood Vessel Anastomosis.—It is a mark of the accomplished technician that he resorts frequently to the use of the stitch ligature for hemostasis. As originally urged by Halsted, it is frequently practical to use a stitch ligature to control a major vessel with suture material of small size, incorporating a minimum of tissue within the tie. Bleeding due to the inadvertent puncture of a blood vessel is easily controlled by a slight twist of the hemostat. An added advantage of the transfixion suture is the greater security of the ligature.

NONABSORBABLE MATERIALS PREFERRED

In the suture method of anastomosis of major blood vessels and the repair of aneurysms, we continue to express a preference for interrupted everting U-sutures of nonabsorbable material. Adoption of a continuous suture for these purposes is a concession to rapid accomplishment of the union. It is interesting to speculate upon the possible difficulties which might arise in later life if continuous nonabsorbable sutures are used in the anastomoses and shunts in young children with cardiovascular anomalies.

Gastrointestinal Anastomosis.—The peculiarities of the blood supply to the gastrointestinal tract from the esophagus to the rectum are such that an extremely strong case may be made out for the routine adherence to interrupted seromuscular sutures. Peritonitis does not result from the

transient fecal contamination incident to the opening of the properly prepared bowel, but from the persistent fistulous leak at the anastomotic site. With precise serosal apposition and avoidance of hemostatic continuous sutures in the outer layers, the immediate and continued integrity of the anastomosis is assured. The same principle may be extended to the use of interrupted sutures for mucosal approximation. This seems to us to be especially important in the esophagus and colon. The more widespread adoption of open anastomoses since the advent of chemotherapy lends itself to the exploitation of the interrupted suture technic and is less apt to result in stricture or stenosis. In general, we have adopted the principle of obtaining a broad area of serous approximation by two layers of sutures in all anastomoses below the diaphragm. In esophagogastric anastomosis a third outer layer of sutures is frequently placed to align and position the segments for anastomosis, but the actual anastomosis is accomplished with two layers of interrupted nonabsorbable sutures.

Sutures in Lobectomy and Pneumonectomy.—For many years it was customary to repair the visceral pleura with atraumatic catgut sutures placed through the pleura and some of the lung substance. As a matter of convenience in the course of operation, the ever available interrupted cotton suture has gradually replaced the catgut suture. No difficulties have been encountered in consequence of this change. The bronchus is closed routinely with cotton sutures.

One ligature and two stitch ligatures are used for the management of the hilar vessels. The stitch ligatures are introduced proximal to the simple ligature and at cross axes to each other.

Catgut Sutures.—The greatest usefulness of catgut is for the apposition of mucous surfaces within the gastrointestinal tract. If hemostatic continuous sutures are to be employed for gastroenterostomy, as is often done in the mucosal layer, catgut avoids the pendulous loop in the lumen of the bowel. It is also felt that a mucosal layer of catgut and a seromuscular layer of nonabsorbable sutures insures the intraluminal evacuation of perianastomotic abscess between the two layers of sutures.

In deep sutures through parenchymatous organs, such as the liver or breast, catgut is preferred. A considerable length of suture is involved and the danger of permanent ductal constriction is to be avoided.

Catgut is also used for the repair of mucous membranes in the urinary bladder and the biliary tract where it is feared concretions might form about a nonabsorbable suture.

Closure of Wounds with Dead Space or Contamination.—It is commonly stated that drains should not be used in association with nonabsorbable sutures. We find this to be a fallacy and do not hesitate to drain a wound closed with cotton, nor is there any hesitancy to close a contaminated wound with cotton sutures. It occasionally happens that cotton sutures will be extruded or require removal with a crochet hook. This is also true of catgut and silk.

Repair of Large Defects.—The use of autogenous grafts of fascia, as introduced by Gallie, has continued to find occasional usage for the repair of fascial defects. It is quite apparent that this material is inert and remains as a living suture. As much cannot be said for the prepared fascia of animal origin which is preserved in various solutions. More recently there has been an attempt to utilize buried skin grafts for similar purpose. It is too early to assess the virtue of buried skin grafts, but an interesting extension of the concept has been enunciated for the closure of tracheal wounds. Further experience and observation is necessary for the final appraisal of these procedures. The substitution of tantalum mesh for reparative procedures in large fascial defects has been advocated, but has not become universally practiced as yet. In general, the use of large quantities of foreign body in a wound is to be deplored.

Reprinted from SURGICAL CLINICS OF NORTH AMERICA, 29: 1565-1570, Oct. 1949 with permission.

Explosion-Proof Incubator

One of the newest pieces of equipment shown at the A.H.A. meeting in St. Louis was an explosion-proof baby incubator, approved by Underwriters' Laboratory, which can be brought into the delivery or operating room where hazardous anesthetic gases are being used.

A grey conductive enamel coating and conductive rubber casters will ground any static electricity. A bright red control panel and red stripe assure the nurse at a glance that she has an explosion-proof incubator ready for service.

Above: Jay Dorsek, Gordon Armstrong Co., explains the control panel to Sr. Olive Cullenberg, administrator, Immanuel Deaconess Hospital, Omaha, Neb. and Corinne L. Loight, superintendent, Hand Hospital, Shenandoah, Ia.

The incubator has constant, automatically-controlled heat and high humidity for premature and term babies. It is used for the administration of oxygen, either with or without humidity and either with or without heat. It has a one-control automatic thermo switch, foot brakes for the front casters and three-ply safety glass.

Manufactured by the Gordon Armstrong Co. the incubator has a sealed-in heating unit which is guaranteed for three years. Quick, free service is offered.

Emergency Treatment of Cardiac Arrest in Surgery

By Robert M. Hosler, M.D., F.A.C.S.* Cleveland

Presented at the A.A.N.A. Meeting, St. Louis

RESUSCITATION comprises two distinct steps; (1) re-establishment of the oxygen system; and (2) restoration of the heart beat. These are separate steps and one should not be confused with the other.

The restoration of the oxygen system is the emergency act. Once this system is restored the crisis is over, as the restoration of the heart beat can then be performed almost any time.

What *should not* be done is important. Do not listen for faint heart sounds. If there is no palpable pulse, no blood pressure, and if respiration has ceased, the surgeon can be certain that any slight movement of the heart which may still be present is of no consequence.

In the re-establishment of the oxygen system, oxygen must be delivered into the blood, and the oxygenated blood must be circulated effectively. The anesthetist must be on his toes. The first thing to be done is to get a properly fitting tube placed into the trachea and then to inflate and deflate the lungs adequately by compression of a rubber bag filled with oxygen. If a tube is in place before failure, so much the better, but this procedure should not take over 30 seconds.

Once the anesthetist can adequately aerate the lungs, the surgeon proceeds boldly to open the chest in order to squeeze the heart which, in turn, will circulate the oxygenated blood. Time for matters such as shaving, cleansing the skin, draping, and sterile gloves are subordinate and hardly need comment. Time should not be spent on asepsis.

The heart is then squeezed upward against the sternum. To permit more room, the costal cartilages of two ribs are cut. Immediately, additional manual massage is undertaken. A short time later a self retaining retractor is introduced and the pericardium can be opened from end to end. An adequate blood pressure to maintain life can be kept up in this fashion for as long as eight hours.

Cardiac Asystole

The heart in asystole may start beating after hand massage alone. If it should not start, about four to five cc's of 1-10,000 epinephrine solution is injected into the chamber of the right ventricle, and massage is continued. It is best to use a long #22 needle, insert it diagonally through the myocardium and withdraw on the plunger so as to be sure it is within the lumen or chamber.

If after three to five miinutes of effective massage there is still no heart beat, epinephrine can be injected for a second or third time. If success has not occurred, an electrocardiogram should be taken to make certain that the heart is not in ventricular fibrillation. If the heart is not in fibrillation and fails to beat, it is because of faulty

* *Associate Director of Course in Cardiac Resuscitation.* *Course made possible by a grant from the Cleveland Heart Assn.*

aeration of the lungs, faulty massage of the heart, or intrinsic cardiac disease.

The importance of movement of the lungs is emphasized. In different prolonger cases a mechanical respirator is of great assistance and may be the difference between success and failure.

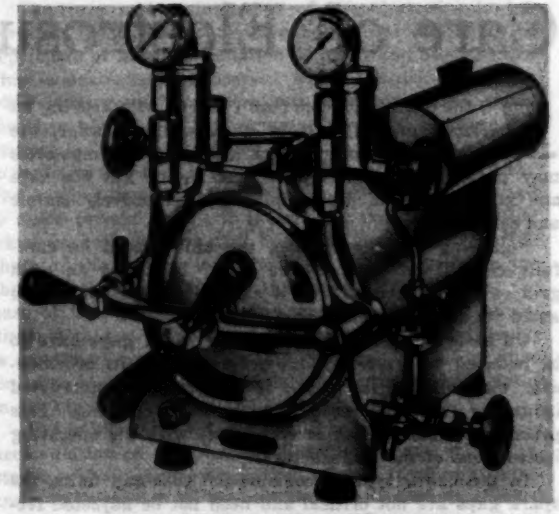
Ventricular Fibrillation

In ventricular fibrillation the heart muscle is in a state of convulsion. There is such incoordination of its muscle fibers that the blood pressure is not maintained. In general the method for defibrillation requires that steps be taken to abolish fibrillation before the coordinated beat can be restored. Inject three to four cc's of 1% procaine into the cavity of the right ventricle and immediately distribute it by massage.

An electric shock is usually required at this juncture. It is applied by placing an electrode on each side of the heart so that as much muscle mass as possible lies between the electrodes. A shock is then applied for a moment. During the moment that the current flows through the heart, the muscle fibers are in a state of contraction. When the current is broken, the ventricles are either in asystole or hole resumed fibrillation.

Epinephrine and massage are used in the manner which has been described. If fibrillation recurs, massage is continued, and the procaine and shock procedure repeated. If fibrillation still persists after two shocks have been applied, massage of the heart is continued and a small dose of epinephrine is used.

New Product



Pelton Autoclave reduces minutes to seconds between consecutive sterilizing periods. No more waiting periods to bring up necessary temperature and pressure. Steam that is already generated is stored under pressure in the outer chamber ready for use. Precision-built, it has an air discharge valve, reservoir-condenser to convert steam to distilled water for re-use, has positive door lock and safety catch is fully automatic. Pelton & Crane Co.

Care of Electrosurgical Units

TO the operating room staff charged with keeping an electrosurgical unit in good working order, the problem of coping with its electrical mysteries may present some anxiety at first sight. Yet the care and maintenance of this appliance is relatively simple and easy to learn.

Following every operation, the unit should be carefully cleaned before it is put away. If it has an open grill or open space on top, it should be kept covered to avoid the accumulation of dust inside.

On some types of older units, the spark gaps have to be polished with emery cloth every six months or whenever the noise of the spark is irregular or interrupted indicating that they need adjusting and cleaning. This procedure is carried out in accordance with the operating instructions of the manufacturer.

In the newer type of combination tube-gap units, the spark gaps are not critical and need not be adjusted frequently for maximum performance. The gaps are either self-compensating or factory pre-set and will give years of reliable service without attention. Some manufacturers have so improved this formerly cumbersome aspect that the entire spark-gap assembly may be removed readily and replaced with a new unit. The advantage of this type of spark gap assembly from the standpoint of maintenance is obvious. It must also be kept in mind that pitted spark gap points may considerably increase the induced electrical currents in the patient circuit.

Tubes are the source of most failures, and there are a few things to remember in connection with their servicing. If a tube is inherently weak, it is likely to fail within the first few hours of service. As a rule, when a tube type of apparatus has been operating satisfactorily for more than ten hours, the tubes can be expected to last for several hundred more.

Replace Tubes with the Same Type

A burned out or weak tube should be replaced with one of exactly the same type and make. A weak tube will throw the load onto the good tube (most machines have two tubes) and so weaken it in turn. This is more likely to happen when the failure occurs after hundreds of hours of use, rather than after the first few hours the unit is in operation. In a unit that has been long in service, it is advisable to replace both tubes when there is evidence of tube failure. Indications of this difficulty are:

failure of the tube to light when current is turned on
a milky white deposit inside the glass
a tube black throughout

The next most serious source of trouble is in the line

cord. A defective plug or a break in the cord (the result of kinking or being pinched under some heavy object) will prevent the passage of current. This is readily observable when the tubes which are known to be in good condition, will not light as the current is turned on. The line cord should be examined frequently for any breaks. Full insertion of plugs in the socket and in the unit socket should be checked each time the unit is used.

The accumulation of static electricity on electrosurgical equipment must be reduced or eliminated as much as possible. Electrosurgical equipment should be equipped with conductive castors. The plugs should be of an explosion-proof variety. Although the choice of anaesthesia is left to the surgeon, ethylene should never be used and the combustible anaesthetic agents—cyclopropane, divinyl ether, ethyl chloride and ethyl ether—should be avoided whenever possible. If one of the latter is used, adequate ventilation must be provided around the patient's head and a barrier must be provided between the anaesthetist and the machine to prevent any escape of fumes. Flammable germicides should not be used to disinfect the skin of a patient when there is possibility of an electrocautery or electrocoagulating machine being used because of the danger of severely burning the patient's skin.

Most units today provide means of grounding by way of the line cord plug.

On equipment which provides voltage regulation, the O.R. staff should check the voltage to the unit immediately before the operation. The correct operating voltage should be indicated on the unit itself.

Care of Electrodes Important

The care and maintenance of the electrodes is important. Loops, blades, needles, ball points should all be kept clean of any accumulation of blood and bits of flesh. This is particularly important with urological electrodes which need special considerations owing to the nature of the electrotomes and cystoscopes. The cord carrying the current to the resectoscopes should be carefully checked to make certain that it provides good contact at both ends. The cutting loop of the resectoscope should be inspected to make certain that it is intact, and that the insulation which covers a portion of it is also in good condition. The shaft of the cutting loop should be fully inserted in the chuck of the cystoscope. If the surgeon feels heat at the base of the cystoscope during the operation, it is an indication that a poor contact somewhere in the cystoscope is creating heat. A cystoscope light that burns out when the current is applied to the loop indicates a short either in the electrotome or in the light cord.

The indifferent electrode should be kept clean from any accumulation of perspiration, Vaseline, or any other substance. The proper connection of the indifferent electrode to the socket on the unit should be carefully checked on every occasion. In placing the indifferent electrode on the operating table, make sure that no portion of the metallic part of the electrode is in contact with metal of the operating table.

In the majority of cases where a surgeon finds that he has inadequate current or no current at all as he starts his first stroke, the failure is due to oversight in

the part of the assistants in setting up the equipment for the operation. Failure in first class equipment is relatively rare, but, of course, all mechanical and electrical equipment is subject to unpredictable failure.

If all the points discussed thus far have been checked and the apparatus fails to function, a loose connection may be suspected. The unit should be disconnected, the back cover removed, and a visual inspection made of all readily visible connections. If a coil or a transformer or any electrical part seems to be burned or charred, it is an indication that there has been a failure in the circuit and the equipment must be repaired.

Leave Major Repairs to Factory

Major repairs to an electrosurgical unit are best left to the factory or to the representative, and except in the case where an exceptionally competent electrical engineer is available it is not advisable to attempt to make any repairs on the spot. A loose connection may be corrected easily enough, or tubes replaced, or spark gaps adjusted, or the gap assembly replaced, but beyond these simple repairs, the circuit should not be tampered with by an unskilled individual.

A deceptively harmless situation, which often is the cause of real trouble, is the interchanging of attachments from several machines. Line cords and indifferent electrodes are especially vulnerable. Only the equipment which is provided by the manufacturer should be used with the parent machine.

Whenever possible, a second electrosurgical unit should be available because failure of a unit in the midst of a procedure without possibility of repairs or replacement can jeopardize the patient's safety.

Most electrosurgical equipment now made requires minimal servicing. With proper care and maintenance, the modern electrosurgical unit should provide six or seven years of continuous service before needing any major repairs or becoming obsolete. Clear, concise operating directions should be posted for the benefit of those not familiar with the operation of the apparatus.

How to Clean Syringes

LIBERAL antibiotic therapy and the hazard of transmission of virus infection from potentially contaminated syringes have presented hospitals with the overwhelming problem of servicing large quantities of syringes. Manual cleaning is negated for three reasons.

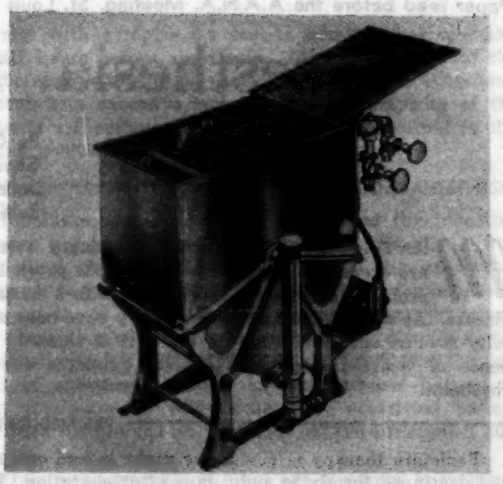
1. Many injectable substances are compounded in oil or stearate bases and are virtually impossible to remove with manual means of washing and mechanical cleaning.
2. Workers are prone to develop severe dermatitis from contact with residual drugs in the syringes.

3. The transmission of virus borne disease from syringes containing contaminated blood.

A 250-bed teaching hospital with ubiquitious laboratory facilities, cleans, packages and sterilizes an average of 8400-9000 syringes a month. Until now, it has required the full time of two women daily for the cleaning alone. Recently a Char Lab was purchased for washing the small glassware incidental to a hospital supply room. It was inadvertently pressed into service for washing syringes and found to be an ideal means for accomplishing this task.

The Char Lab is a mechanical washer in which horizontal revolving discs are arranged to support adjustable trays and baskets which carry the glassware into the washing solution and out again to drain. After the glassware is washed, the water is drained and a hot or cold water rinse is turned in. The syringes are left impecable clean, thoroughly rinsed. The breakage is nil.

Baskets accommodating approximately 50 syringes of assorted sizes are provided in the ward utility rooms. These baskets are kept submerged in a solution of non-ionizing detergent such as Glim. As the syringes are returned to the utility room, they are separated, banded and placed in an upright position in the basket with the barrel opening in the dependent position. The baskets are collected at regular intervals by the supply room orderly; empty baskets are left in place and the full baskets are returned to the supply room. They are checked to assure a full load, placed in the Char Lab and set to wash.



The Char Lab washes about 200 syringes in 20 min. and requires the time of ¼ person for operation.

The purchase of this apparatus can be justified for an institution of any size not only because it so effectively reduces the magnitude of the syringe problem, but also because it is a versatile device that can assume the task of cleaning glassware currently washed by hand.

Paper read before the A.A.N.A. Meeting, St. Louis

Anesthesia for Heart Surgery

By Olive L. Berger, R.N.
Senior Anesthetist
Johns Hopkins Hospital
Baltimore

MANY of the patients with pulmonary stenosis are cyanotic children who present the psychologic problems common to all children with a disabling disease. As with all cardiac patients, they have been carefully studied and have been on digitalis if there is evidence of heart failure and possibly quinidine for arrhythmia.

PRE-MEDICATION

Penicillin therapy is begun the night before operation and continued for six to eight days after operation. Morphine and atropine are administered approximately ninety minutes before the onset of anesthesia.

Patients with congenital cardiac disease, including the infants, appear to have a high tolerance for morphine. The present trend is toward slightly larger doses than were formerly administered. The dose is computed on the basis of body weight, 1 milligram for each five kilograms plus an additional 0.5 to 1 milligram, depending on the condition of the patient. Atropine is administered in a ratio of one-twentieth of the morphine medication up to a maximum of 0.6 milligrams.

ANESTHESIA

Induction by the semi-closed method, maintenance by the to and fro absorption, endotracheal technic has been employed. For children and infants cyclopropane, oxygen and ether have been used. After intubation, anesthesia is continued with a mixture of ether and oxygen.

Older patients are anesthetized with 2.5% thiopental sodium (Pentothal sodium) and d-tubo-curarine until they have been intubated. As with the children, maintenance is by means of a mixture of ether and oxygen. Curare is administered only once to facilitate intubation.

Unless present before operation, arrhythmias are usually transient and are readily controlled by Xylocaine (1%) injected into the pericardial sac plus ½% procaine into the myocardium at the site of incision. In general,

it is now considered better to treat conditions as they arise rather than to treat, prematurely, a condition which may not develop.

Assisted respiration by means of manual manipulations of the breathing bag is carried out continuously during anesthesia. The lung is held in as much expansion as is compatible with exposure necessary for the surgical procedure. If deflation of the lung is necessary for adequate exposure, the patient is frequently given a rest period to permit reinflation of the lung and essential ventilation.

Early in the operation when the pericardium is opened, the pulse may become barely perceptible and the blood pressure unobtainable. The operation should be continued with dispatch, because delay in dividing the valve with the hope of improving cardiac contraction with drugs or oxygen may result fatally. After the valve has been divided, the lung is reinflated and there is usually pronounced improvement in cardiac tone with a return to normal of the pulse and blood pressure. An ice cap is placed over the soda lime canister routinely to prevent heat retention.

MITRAL STENOSIS

In the surgical treatment of mitral stenosis, adequate preoperative sedation is of utmost importance. Phenobarbital is administered the night before operation and repeated if necessary the next morning. Morphine 12 to 16 mg. with atropine 0.6 mg. is administered one and a half hours before anesthesia. At the discretion of the cardiologist atropine has been omitted for the occasional patient with excessive tachycardia. The majority of the patients are orthopneic and must be anesthetized in the sitting position.

INHALATION ANESTHESIA

Inhalation anesthesia is to be avoided for induction because pulmonary edema is frequently present.

Sodium Pentothal 2.5% plus 12 to 15 mg. of d-tubocurarine to facilitate intubation is employed for induction. The anesthesia is maintained with ether/oxygen by to and fro absorption with the canister connected directly to the tracheal catheter. After induction and intubation the conduct of anesthesia follows the same general pattern as that for pulmonic valvulotomy. An occasional patient has been maintained on Pentothal oxygen throughout surgery.

Only small amounts of ether are necessary to maintain the patient in mid plane 1. All patients are reacting or conscious at the completion of surgery.

Should hypotension develop before the chest is opened a small dose of a vasopressor drug may be administered.

Before the start of surgery a cut-down is made on an ankle vein and whole blood administered to the estimated amount of blood loss. Overloading of the vascular bed must be avoided during surgery.

Polyethylene Plate for Cranioplasty

By Eben Alexander, Jr., M.D. and Peter H. Dillard, M.D.*

**Department of Neurosurgery, The Bowman Gray School of Medicine and The North Carolina Baptist Hospital, Winston-Salem, N.C.* *Abstracted from "The Use of Pure Polyethylene Plate for Cranioplasty", Journal of Neurosurgery, 1950, Vol. VII, No. 6, pages 492-98, with permission.*

Samples of Polyethylene plate, 3.25 mm. in thickness, molded in unusual shapes after immersion in hot water. The plate will retain these contours after it has been cooled.

OF THE materials used for covering skull defects, pure Polyethylene plate seems to have the desirable properties of the substances previously used without their disadvantages.

Alexander and Dillard of the Department of Neurosurgery, the Bowman Gray School of Medicine and the North Carolina Baptist Hospital at Winston-Salem, in the Journal of Neurosurgery, state that this synthetic plastic approaches the ideal so far as material for cranioplasty in human patients is concerned.

Pure Polyethylene does not cause tissue reaction, and its physical properties are not apparently changed by contact with body fluid. It maintains contour and does not change its physical properties at extremes of body temperature.

It is neither epileptogenic nor carcinogenic; it does not cast an opaque shadow in roentgenograms; and it is easily malleable when heated in boiling water to make it convenient for use at the operating table.

The plate may be obtained in various thicknesses from

3 mm. to 8 mm., depending on the thickness of the bone surrounding the skull defect. The operative field is prepared as for any cranioplasty, reflecting the scalp, removing the periosteum and scar tissue from the edges of the defect, and if necessary making a shelf through the outer table of the skull around the circumference of the defect into which the plate can be conveniently fitted.

Polyethylene plate is sterilized by soaking in 1:1000 aqueous solution of Zephiran for 18 hours, taking care to weight the plate below the surface of the solution with a heavier object such as gauze. Care should be taken that the plate is free of all foreign material before it is subjected to chemical sterilization and that all surfaces are in contact with the solution during the entire period of sterilization. It may be boiled but will not withstand sterilization by autoclaving. The material is not affected at room temperatures by concentrated hydrochloric acid. Experiments have demonstrated the feasibility of sterilizing the material by preliminary immersion in concentrated hydrochloric acid followed by washing in sterile distilled water and further immersion in 1:1000 Zephiran

Above: Postoperative x-ray of skull. The thin tantalum wires embedded in the polyethylene plate are visible although the plastic itself casts no shadow.

until such time as it is needed at operation.

A part of the plate is cut out with heavy scissors, knife, shears, or with the actual cautery which melts the plastic as it cuts through it, until it is of approximately the size of the skull defect. The edges can then be trimmed either with a scalpel or by the use of bone rongeurs until an exact fit is obtained.

Contour is easily established by immersing the entire

plate in boiling water for 30 to 60 seconds, after which it can be bent or shaped as desired. Cooling the plastic quickly by immersing it in sterile cold water will serve to fix the contour. Minor alterations can be made by repeating the process until the plate conforms to the desired shape. A plate can be made thicker in its central portion than at its edges to fill in the dead space of a large defect as necessary. Small drill holes are made in the plate and in the adjacent bone to fix the plate in place with silk or wire sutures.

Since the plate is not opaque to roentgen rays it has been found helpful to embed fine tantalum wire in the superficial surface of the Polyethylene so that subsequent films will disclose the position of the plate. These wires are barely visible in postoperative films and do not obscure any detail of underlying structures. Wire is conveniently embedded in Polyethylene by making grooves approximately 1 mm. in depth across the diameter of the plate with the point of the actual cautery, placing the wire in the groove, and sealing it in place by running the flat surface of the cautery over the surface.

‡

New Product

The Sterile Operating Lamp projects a beam of cold parallel light rays, maneuverable by the operating surgeon into the work area at any needed angle. Sterilizable, interchangeable lucite light bars are used for projected light. Explosion and spark proof, the lamp complies with requirements of the NFPA and the National Electric Code for operating rooms. Two models available—"A" mounts anywhere on the operating table rail. Model "AP" is portable floor model. Harold L. Feighner & Co.

Surgical Notes

James F. Fleming, M.D.

Surgical Infections

Since the introduction of the potent chemotherapeutic and antibiotic agents, there has been a trend to lessen the importance of time-honored surgical principles and bank too heavily upon the drugs alone.

H. Rocke Robertson, in the *Bulletin of the Vancouver Medical Association*, July, 1951, warns that we should not be complacent about this situation, since there are organisms and strains which are not sensitive to the drugs.

Another instance in which error crops up is in the assumption that fever and pain are always caused by bacterial invasion. The author cites as an example the usual form of thrombophlebitis following delivery, injury or operation.

Many abscesses, particularly in accessible locations, can be considered surgical cases, with the simplest of operations as the treatment: incision and drainage. The author does not state that the newer drugs are not indicated as adjunctive measures in these conditions, but he emphasizes that in these local infections surgical measures hold first place, whereas in generalized infection the antibiotics and chemotherapeutic agents are the mainstay of treatment.

Abdominal Pregnancy

Steps in treatment of abdominal pregnancy are discussed by MacGregor, of Brooklyn, in *American Journal of Surgery*, September, 1951.

Except in a few instances in which the patient remains hospitalized under careful observation, operation is not deferred.

The first step after opening the abdomen is incision of the sac and very gentle removal of the fetus.

If there is no bleeding or infection and the placental blood supply sources are inaccessible, the placenta may be left in situ and the abdomen closed without drainage. The same procedure may be done in certain instances to avoid hysterectomy. Otherwise, removal of the placenta has given best results, as indicated by the literature.

Blood Transfusion Guide Developed

A dye which acts as a guide in administering blood transfusions soon will be produced by Warner-Hudnut, Inc.

Known as Evans Blue Dye, this formula acts as a guide for measuring a patient's circulating blood volume, but, until now, it has been supplied as a research service only.

In addition to determining circulating blood volume, Evans Blue Dye has been found to serve many other purposes. It has been used experimentally to determine the efficiency of the heart and to help spot valve defects.

This dye also has been employed in evaluating blood substitutes and in investigating the permeability of various tissues as a result of drug action. This product has been

known for many years, but only recently have hospitals begun its routine use.

The prime advantage in using Evans Blue Dye to measure circulating blood volume is that it combines chemically with blood plasma without harming the body and travels through the body with the plasma. In determining circulating blood volume, a known quantity of dye is injected into a vein. After a suitable interval for the dye to distribute itself throughout the system, a blood sample is drawn.

The color of the dye sample is then compared with that of a standard solution of the dye. Subsequent arithmetic calculations determine the total plasma volume and enable the physician to determine whether whole blood, plasma, or washed red corpuscles represent the patient's need.

Cardiac Arrest During Anesthesia

When cardiac standstill occurs during deep anesthesia, stimulants such as epinephrine are not likely to be of value, according to Guyton, in *The Mississippi Doctor*, August, 1951.

In these cases, he finds that it frequently becomes necessary to hand-pump the heart. When this is successful, much of the anesthetic will be removed promptly from the circulation.

For effective hand-pumping, a long incision is rapidly made in the fourth or fifth left interspace, extending almost from the sternum and sectioning several costal cartilages. The heart is rhythmically and forcefully compressed against the sternum at a rate of about 50 per minute. Adjunctively, oxygen and artificial respiration are administered.

If there is evidence of air embolus in the heart as a cause of arrest, rapidly shifting the position of the patient might be of help. In the upright position, it appears that gas does not become entrapped easily in the ventricles, but passes into the pulmonary artery and aorta instead.

For ventricular fibrillation, a most common cause of circulatory arrest, several methods have been recommended, such as injection of potassium followed by calcium, and also injection of a procaine derivative.

The author has found a method depending on countershock to be most practical in his hands. As a result of animal studies, Guyton believes that 110 volts alternating current at approximately 4 amperes, when applied to 3-inch electrodes tightly compressed to the two sides of the heart, should be an effective stimulus for defibrillation. For through-the-chest defibrillation, approximately 440 volts at 30 to 60 amperes, applied to 5-inch anterior and posterior electrodes well saturated with electrode paste or concentrated salt solution should be an effective stimulus. This should be done within a minute or so of the onset of fibrillation.

When Is Sympathectomy Effective?

Whitelaw and Smithwick, of Massachusetts Memorial Hospitals and The Boston University School of Medicine, at-

tempt to clarify the physiological mechanisms involved in the various types of hypertension, as a result of their experiences in some 3000 cases treated thus far.

Writing in *Angiology*, June, 1951, the authors state that hypertension is due to one of three factors, or a combination: neurogenic, humoral or mechanical.

Extensive sympathectomy is effective in lowering the blood pressure, reversing the disease process and modifying hyperactivity when the neurogenic factor is dominant.

In cases of longstanding, sympathectomy is not likely to be as effective, since the humoral and mechanical factors complicate the picture.

Hypertensive cardiovascular disease usually progresses from the normotensive hyperreactor to intermittent hypertension, and from there to sustained hypertension in most cases on a neurogenic basis. If the neurogenic factor is interrupted early after development of sustained hypertension in these cases, progress of the disease may be halted or reversed by sympathectomy. For intermittent hypertension, the operation is not recommended unless cardiovascular involvement is present.

Wound Cleansing

Crystalline trypsin, produced by The Armour Laboratories of Chicago under the brand name Tryptar, is now available to hospitals.

Tryptar is an extremely pure form of trypsin, an enzyme produced in the mammalian pancreas, the function of which in nature is to break down and digest proteins. It has been known for many years, but it had no particular use and The Armour Laboratories kept only a few grams available as a special service to research and teaching.

Last year, however, its value as a drug was established by research surgeons at Ohio State University who showed that it could be safely and successfully used to digest away the debris (largely protein) of various types of disease, leaving for the surgeon clean wounds which heal quickly.

From tuberculous empyema, in which its value was first demonstrated, it has now been extended to such conditions as ulcers of various types, osteomyelitis, gangrene, frostbite, mangled traumatic wounds and infections of other cavities. In each, it dissects away the dead tissue chemically, leaving only healthy tissues. It has also been found that removal of dead tissue eliminates infection, though Tryptar does not affect bacteria directly.

The unique value of Tryptar in this use—which can be duplicated with other enzymes of vegetable or bacteriological origin—is that Tryptar, unlike some others, does not affect living tissue.

Sound or viable tissue contains anti-trypsin or trypsin-inhibitor, which stops the action of trypsin almost instantaneously. Thus, when the drug has liquefied the dead tissue of an ulcer or the blood and serum clots of an infected chest cavity, no damage is done to the adjoining good tissue.

Medical Problems

By George
Attorney

Paper read before nursing and operating room staff at St. Joseph's Hospital, San Francisco.

Although the operating room is a small portion of the facilities of any hospital and involves a limited number of hospital personnel, it is perhaps the source of more legal problems, particularly malpractice cases, than any other adjunct of the doctor-nurse-hospital-patient relationship.

Generally speaking, a surgical nurse may become involved in legal difficulties in three different capacities. First of all, as a regular paid employee of the hospital the nurse is an agent of the hospital and the employer is liable under the law for actions or omissions in connection with patients.

Secondly, under particular situations arising most often during the actual performance of surgery, a surgical nurse becomes the special agent or employee of the surgeon who is in charge of the procedures in the operating room. The nurse acts subject to his direction and control and in certain circumstances the law will impose liability upon the surgeon for the acts or omissions of the surgical nurse.

Thirdly, as one engaged in the practice of a profession,

-Legal in O.R.

A. Smith
San Francisco

there are certain duties and obligations to the patient in surgery and liability may be imposed directly upon the nurse. There was a time when the nurse involved in a malpractice claim was seldom named as a party defendant in the action. The trend today seems to be for plaintiff's lawyers engaged in this type of action to name as defendants all parties concerned, the hospital, the nurses and the doctors.

The legal necessity for consent to an operation arises out of the principle that any operation performed upon a patient without a proper consent is a technical assault and will render the participants in the operation liable to damages for assault and battery without regard to the success or failure of the surgical procedure.

WRITTEN CONSENT IS PROOF

The reason for having the consent in writing is not that it must be in writing to be legal, but that it is more susceptible of proof. Oral consent is just as binding but, of course, is more difficult to prove than a consent over the signature of the patient.

Any competent adult may consent to the performance of an operation upon his person. A married woman can

consent to the performance of an operation, and her husband's consent is ordinarily not necessary. There are, of course, certain types of surgery which may involve results such as sterility, where it is desirable to obtain the husband's consent as well, to an operation on the wife, or the wife's consent to the operation on the husband, along with an acknowledgment that they understand that the operation to be performed may result in the spouse becoming sterile. This is the exceptional case; ordinarily the wife or husband need not sign the consent to an operation upon the other.

In the case of an adult who is an incompetent, the consent of the legal guardian is necessary before surgery. In the case of minors the consent of the parents should be obtained before surgery is performed.

In an emergency where immediate surgery is necessary for the preservation of the life or health of the patient, it may be done without consent. For example, in the case of accident, with an unconscious adult it would be technically permissible under the law to proceed with such immediate surgery as was necessary to save his life, even though his consent to the surgery could not be obtained because of his physical condition. The same would be true in the case of a child where the parents were not available to sign the consent.

To permit a patient to die from lack of surgery because no one has signed a written consent might give rise to greater legal difficulties than if surgery were proceeded with immediately and the patient's life saved. On the other hand there have been numerous cases where emergency patients have been treated and later they have sued on the theory they were treated without their consent. Surgery in such cases should be held to the minimum necessary to save the life or health of the patient.

Another question that was raised was the length of time for which a signed operative permit will be good, three months, six months or indefinitely? Unfortunately there is no definite legal answer to that question and the decision must be made on the basis of reason. Extreme cases, of course, are easier to decide. Obviously a patient who signs a consent for an operation which is not performed at the time expected and who returns to the hospital many months or a year later should be required to sign a new permit, as the first permit would probably be held by the courts to be of no value. On the other hand, a delay of a few days in the performance of surgery would not ordinarily invalidate an operative permit in the absence of other circumstances which may have indicated to the patient that the surgery was not going to be performed. Generally speaking, it would be our recommendation that an operative permit be obtained as close to the time of surgery as possible but still at a time when the patient is not under the influence of sedatives or other pre/operative medications.

Assuming that the proper consent has been obtained liability for occurrences in the operating room must then be based on negligence.

CLAIMS IN MALPRACTICE

There are two essential elements in any plaintiff's claim for malpractice. First, there must be a violation of

the duty owed to the patient by the doctor, nurse, or hospital, and secondly, the patient must suffer injury as a result of such violation. Generally speaking, in the care of a patient a doctor, hospital or nurse owes a duty to the patient to possess and exercise the degree of care, skill and knowledge ordinarily possessed and exercised in the community by other reputable doctors, hospitals and nurses. In other words, the standard set is a relative standard.

Perhaps the first matter of importance in point of time is the necessity for the operating room to have all necessary equipment and supplies in it which may reasonably be required in the care of the patient, and the equipment must be in good operating order.

WATCH PATIENT CONSTANTLY

A "must" precaution for the operating room nurse and all personnel in the operating room is to maintain a constant vigil over the patient to prevent injury to the patient from sources other than the actual surgery.

Although many new safeguards have been developed, we still have an occasional malpractice case involving the leaving of a sponge, a needle, a loose piece of suture or a surgical instrument inside of the patient.

The possibility of a successful defense of a case involving the leaving of a foreign matter in a patient is negligible unless it can be clearly shown that the nurses and surgeons exercised all of the customary safety precautions.

Another type of malpractice case involving the surgical nurse is the confusion of types of solutions or medications in the operating room, making it essential that extreme care be exercised to prevent the confusion of any caustic substance with anesthetics or solutions customarily used.

In addition to the duty to exercise reasonable care toward the patient, another duty is to refrain from disclosing any information obtained in the course of care and treatment of the patient. In this respect the nurse is in much the same position as the physician, and any information obtained is classified as confidential. For example, there have been actions involving unauthorized filming of surgical operations.

As a general principle, it is well to keep in mind that discussions of operations upon particular patients as to what was done and as to what occurred, should be avoided. In this connection a chance remark about an incident in the operating room may even provoke a malpractice case where there has been nothing wrong whatsoever.

Unauthorized persons should never be permitted in the operating room and the number of authorized persons other than the doctors and nurses should be kept to a minimum.

Perhaps one of the best safeguards against legal difficulties is the maintenance of complete and adequate records of everything that is done in the care of the patient in a hospital, and most important everything that is done in the preparation of a patient for surgery, in the administration of the anesthetic in surgery, in the description of the surgery actually performed, the type and number of sutures used and all other details.

Question Box

Each month questions on [illegible] answered by Dr. [illegible] room technic [illegible] MacMillan. Q[illegible] Hospital Topics.

Q. Can a home dish washer, such as Apex, with racks made to accommodate syringes and also metal dressing cans, be used in the central supply room? Approximately 250 syringes a day pass through our department from 2 cc to 50 cc syringes. Hub caps are used throughout. *A.B.H., Connecticut.*

A. I do not believe that you will find a home dishwasher satisfactory for use in the supply room. We have tried to use such a device here but found it did not clean the inside of the syringes.

Q. We have been considering the problem of conductive rubber shoes in our hospital and have been advised against the shoes because of the loss of their conductivity in a short time. Would you please advise me as to how this problem stands today and to the best solution? *L. D., Connecticut.*

A. The chief difficulty I have encountered with conductive sole shoes lies in the fact that dirt is picked up on the soles which insulates them from the floor. This is common of all types of conductive material. The soles of the shoes must be cleaned daily where their use is not restricted to the operating room and where the operating room floors are not kept clean. An easy check of their efficiency is to require personnel to test their conductivity each morning. I know of no better solution to the problem than conductive sole shoes. The various mechanical grounding devices are too faulty to be considered.

Q. What is the best method of resterilizing arterial sutures? Will placing them in zepharin solution be adequate? *J.E.H., Kentucky.*

A. Silk or cotton can be resterilized by exposure to saturated steam at 250° in the steam sterilizer. In order to prevent superheating which chars the textile and hence decreases the tensile strength, be certain to moisten the suture material before it is placed in the sterilizer.

Q. What is the correct technic for sterilizing syringes?—*E.L.M., Pennsylvania.*

A. Currently the syringes at the Peter Bent Brigham are being sterilized unwrapped and assembled with a plastic tip to protect the syringe tip in *dry heat* for 6 hours at 250° F.

Reports from Tri-State Assembly

Chicago

Combined Anesthesia

Sister M. Reginella, R.N., B.S., Director, School of Anesthesia, St. Mary of Nazareth Hospital, Chicago, Ill.—A combination of pentothal sodium, nitrous oxide and oxygen permits the anesthetist to give smaller doses of both agents and still obtain an excellent hypnotic and analgesic effect. A mixture of 50% to 75% of nitrous oxide and oxygen is inhaled during pentothal administration; the amount of pentothal needed is reduced and non-explosive conditions are maintained, while an abundance of oxygen is still provided. This combination is widely used, but there is one drawback—a lack of muscular relaxation. This may be met by the use of curare.

Curare paralyzes voluntary muscles by breaking the connection between the muscle and its motor nerve, the diaphragm being the last muscle to be affected. The conservative use of curare, as a method of improving relaxation, particularly when used in conjunction with pentothal sodium, nitrous oxide and oxygen has been advantageous in many instances. It causes very little circulatory depression, even in poor risk patients, if they are well oxygenated at all times. Although many patients tolerate large doses of curare, we have observed fewer complications when it is given in small divided doses, and when the total quantity of the drug is limited to 100 units.

Pentothal Sodium, Nitrous Oxide and Curare

Various methods have been advocated for the administration of pentothal sodium; the most common is still the intermittent syringe technic given in a 2.5% solution. We have found that dilutions of pentothal sodium of 1% or .5% are practical, often safer, easily administered, and more economical than the less dilute solutions.

The solution is allowed to drip at a moderate rate until the patient loses consciousness, which is characterized by his inability to respond when spoken to, by relaxation of the jaw, shallow respiration and abolishment of lid reflexes. Once the desired depth of anesthesia is reached, the rate of flow is reduced to a slow drip.

Upon the patient's loss of consciousness, the inhalation of two liters of nitrous oxide and 700 cc. of oxygen, by

the semiclosed carbon dioxide absorption technic, is then started and is continued during the operation. Careful consideration is given to the maintenance of an unobstructed airway. This is accomplished in all cases by the use of a pharyngeal airway. Over 80% nitrous oxide is never used, and usually 75% nitrous oxide gives adequate anesthesia; cyanosis and anoxia are not expected with the low concentrations used and are not tolerated. The principal guide to the satisfaction of the patient's need for oxygen is the pulse rate.

The next step, then, requires that upon skin incision an initial dose of 40 units of curare be given intravenously. This amount is generally sufficient to produce good relaxation in the average adult in good physical condition. Small initial doses are preferred for poor risk patients and the aged. Occasionally it is necessary to give an addition of 20 units when the peritoneum was opened. The maximum amount of pentothal to be given within the limits of safety is 1.5 to 2 grams. Electrosurgical procedures may be carried on for several hours under this technic.

Intravenous Hypnosis, Inhalation and Nerve Block, and Intravenous Hypnosis, Inhalation and Spinal Technics

This combination has been successfully employed by Jarman and others. After the completion of the spinal anesthetic, an injection of about one-half gram of pentothal is administered intravenously and followed by the inhalation of nitrous oxide and oxygen, 75-25 or 50-60, respectively.

The continuous administration of 0.1% pentothal sodium gives relief to the patient who is nervous, apprehensive and complaining during the operation.

One gram of pentothal is prepared in the usual manner and then added to a bottle containing 1000 cc of 5% glucose in normal saline solution. This is given intravenously with the use of a glass drip meter to determine the rate of flow. The flow is increased or decreased according to the response of the patient. This weak solution of pentothal sodium should be given slowly enough to produce merely light sedation. The patient will be drowsy but may be aroused to answer questions.

High dilution of pentothal sodium is very advantageous when given throughout the entire period of local anesthesia. When it is given with regional anesthesia, there is much less tendency toward shock than when the patient is awake.

Local and spinal anesthesia may be used in conjunction with small doses of pentothal, as well as general anesthesia of nitrous oxide and oxygen mixture in percentages of 75-25 or 50-50 respectively.

Pentothal Sodium, Cyclopropane and Ether

As a preliminary to other agents, pentothal sodium is very useful in that the apprehension experienced in the state of wakefulness or induced by the application of a mask, smothering sensations can be eliminated before the gas is started. Although the former combinations are preferable, yet cyclopropane and ether are of significant value and neither deserves to be discarded.

Anesthesia in Thoracic Surgery

W. G. Mackenzie, M.D., Fellow American College of Anesthesiologists, Chief, Dept. of Anesthesia, Grace Hospital, Northwestern Branch, Detroit—The patient should be awake and active for two hours prior to surgery. This allows time for postural drainage and expectoration of secretions which have accumulated during the night. Premedication is given intravenously in the operating room and never exceeds ⅙ grain of morphine sulphate with either atropine or scopolamine.

Induction with pentothal is almost immediately started. If the patient is nervous or apprehensive this may be carried out in his bed. When the patient has lost consciousness a curare derivative is given.

Anesthesia is deepened to surgical anesthesia. It may be necessary to support respiratory movements by the use of oxygen and pressure on the bag of a gas machine. At least three minutes should elapse from the time of giving curare before attempting the next step, intubation. Trans-oral intubation is an absolute necessity.

Under anesthesia the cords will be seen only as a narrow slit that opens slightly on expiration. They are sprayed through the laryngoscope with 10 per cent of cocaine and in a few seconds they will be seen to open more widely.

The tip of the endotracheal tube is introduced until it is within a ¼ inch of the cords. As the cords separate on expiration pass the tube. Be careful that the tip of the stilette is at least ½ inch within the endotracheal tube. The endotracheal tube is now connected to a gas machine supplying a 50-50 mixture of nitrous oxide and oxygen, and the patient placed in position for surgery.

Important Books in Surgery

Willis G. Diffenbaugh, M.D., Associate Attending Surgeon, St. Luke's Hospital, Clinical Assistant Professor of Surgery, University of Illinois College of Medicine, Chicago—The surgical literature of today has become so voluminous that it is very difficult, if not impossible, to keep abreast in all fields. Even the field of a limited surgical specialty is so great that it is a problem to cover it thoroughly. Here are a few of the things which help the surgeon in his attempt to keep up in his reading.

Reference and abstract sources are of great importance. The Quarterly Cumulative Index Medicus is an essential. Its chief difficulty is that it is always two years behind. International Abstracts of Surgery published by Surgery, Gynecology and Obstetrics; the International Surgical Digest published by W. F. Prior & Co.; and the Abstracts of World Surgery, Obstetrics and Gyneology published by the British Medical Association are valuable references.

The medical library should have as complete sets as possible of the more important surgical journals including the following: *Annals of Surgery*, official journal of the American Surgical Association — Lippincott; *Surgery, Gynecology and Obstetrics*, official journal of the American

College of Surgeons; *Archives of Surgery*, published by the A.M.A.; *Surgery*, Mosby; *American Journal of Surgery, Western Journal of Surgery, Obstetrics and Gynecology; British Journal of Surgery*, Wms. & Wilkins; *Journal of Thoracic Surgery*, Mosby; *Plastic and Reconstructive Surgery*, Wms. & Wilkins; *Cancer*, Hoeber; *Journal of Urology*, Wms. & Wilkins; *Obstetrical and Gynecological Surgery*, Wms. & Wilkins; and the *Journal of Bone and Joint Surgery*.

We find it helpful to have duplicates of recent unbound journals of the last several years so that withdrawals will not tie up a bound reference volume. It is also much more convenient for the doctor to check out and carry a monthly issue of a journal than the one half or full year's bound journal. After a few years when the call is less, they can be sold or traded and no real loss accrues to the library from the duplication.

Standard reference works in surgery are necessary. Surgical literature must cover the fields of the basic sciences related to surgery, namely, anatomy, physiology, and pathology as well as general and abdominal surgery. Also it must include the surgical specialties of head and neck, neurosurgery, thoracic surgery, orthopedics, gynecology, urology, plastic surgery, and the newer field of vascular surgery. A duplication of texts is not necessary. It is wise to invest the current hospital library funds in journals and the excellent monographs on special surgical subjects which are being published rather than in too many systems and duplication of standard texts which rapidly become out-dated.

The medical library should have some classics of surgery and related basic sciences, so that internes and surgical resident become acquainted with the contributions of those before us.

The medical librarian will find it helpful when making decisions as to current purchases of books and monographs to have the advice of an attending surgeon who is interested in research work and well acquainted with surgical literature.

Surgical Notes

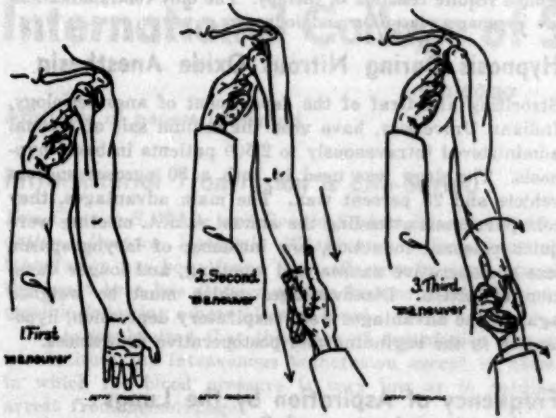
By James F. Fleming, M.D.

Simplified Shoulder Dislocation Reduction

Although the method is not described as new or original, a treatment is described by Callahan, of Seattle, in the *American Journal of Surgery*, May, 1951, combining the utmost in simplicity with effectiveness.

Reduction of a shoulder dislocation begins with clear x-rays, preferably stereoscopic views. The position of the humeral head can be determined and any fracture can be evaluated.

Absolute relaxation is essential, the author using intravenous pentothal (R) supplemented with curare.



5 6 7

Above: Fig. 5, Left dislocation; first maneuver. Fig. 6, Left dislocation; second maneuver. Fig. 7, Left dislocation; third maneuver. (Illustration, courtesy, American Journal of Surgery).

In left-sided dislocations, the patient is placed on his back, with the operator facing him. The operator's right hand grasps the left hand of the patient, and gentle traction is made in a straight line from the shoulder to the hand. The arm is kept parallel with the patient's body rather than flexed, but is abducted to about 45 degrees.

While traction is being applied, the index and middle fingers of the operator's left hand palpate the head of the humerus. The head is then gently skidded outward and upward while the humerus is being gently rotated externally. The head can usually be felt and heard to move past the lower border of the glenoid fossa and slip into the socket.

With the reduction complete, the elbow is then flexed to a comfortable position with the hand on the chest. Padding is placed in the axilla and antecubital fossa, and the arm is immobilized against the side with wide adhesive tape.

This method is certainly simpler than most of the described treatments for simple shoulder dislocation, and the author finds it to be quite effective.

Automatic Breather

A newly developed automatic breathing apparatus for treating victims of wartime gases and radio-active particles was recently demonstrated for safety and medical directors of industrial concerns and institutions.

Feature of the instrument, known as the Pneolator, is its ability to administer artificial respiration automatically without inducing negative pressure. It was explained that in the cases of persons who have inhaled irritant gases or radio-active particles, suction could be harmful to damaged lung tissues.

The Pneolator administers oxygen with positive pressure through a tiny valve that cycles regularly to control the flow according to predetermined settings. When oxygen supply shuts off, the victim exhales by relaxation of lung walls and diaphragm muscles. The action is similar to inflating a balloon and then permitting air to escape by releasing the neck.

Oxygen flow can be controlled so precisely that the instrument

is safe to use even on newly born infants, it was stated.

The intermittent positive pressure breathing valve in the Pneolator is an outgrowth of research at the Aero-Medical Laboratory of the Air Force at Wright Field, Dayton, O., where it was developed during World War II to administer automatic artificial respiration to unconscious fliers at high altitudes.

Subsequently, it was adopted for clinical use on arrested breathing cases, including polio, at many leading medical centers. Basically, the artificial respiration operation of the Pneolator is for victims whose breathing has been interrupted from any cause.

New Thyroid Therapy Helps Surgeon

Announcement is made of an anti-thyroid drug that causes rapid remission of symptoms of thyrotoxicosis, and yet is non-goitrogenic in most cases. This valuable new therapeutic agent, is presented by Ciba. In this new drug, iodine is organically bound in the thiouracil molecule.

Clinical reports on the use of Itrumil (iodothiouracil sodium salt) show that it lowers the basal metabolic rate to normal in most cases within about two weeks. One of the outstanding advantages from the surgeon's standpoint is that it causes involution of the hyperthyroid gland with a reduction in the vascularity and friability.

One surgeon has termed Itrumil therapy preceding thyroidectomy as: "The method of choice in large, nodular goiters and substernal thyroid enlargements, as well as thyroid glands which are the seat of diffuse hyperplasia."

Extremely high dosage has been used and even with prolonged treatment there have been no severe toxic reactions. Even the few side effects encountered have been mild and seldom require cessation of therapy. The only contraindications are pregnancy, lactation and iodism.

Hypnosis During Nitrous Oxide Anesthesia

Stroelting and Graf of the department of anesthesiology, Indiana University, have used the sodium salt of seconal administered intravenously to 2,500 patients in basal hypnosis. The drug was used in both a 50 percent sucrose vehicle and 25 percent wax. The main advantages, they told physicians attending the annual A.M.A. meeting were quick pleasant induction, low incidence of laryngospasm, less postoperative nausea and vomiting, and longer duration of action. Disadvantages which must be weighed against the advantages were respiratory depression, hypotension in the beginning and postoperative drowsiness.

Frequency of Aspiration by the Lungs During Anesthesia and Surgery

Culver, Makel, and Beecher report in *Annals of Surgery, 1951:133:* that a dye was introduced into the stomachs of 300 unselected patients prior to surgery. After surgery, the pharynx and bronchi were examined for staining. Regurgitation occurred in 26% of these patients. Aspiration into the lungs occurred in 16%. Silent aspiration was present in 8%. Trendelenburg or lateral positions produced much more regurgitation than other positions. Patients of inexperienced anesthetists are more liable to aspirate. The authors conclude that an empty stomach during surgery is absolutely essential.

International College of Surgeons Meeting

Chicago

Abstracts of papers presented

Intra-Arterial Transfusion is Life-Saving

Drs. Charles S. White and Donald Stubbs, Research Foundation, Doctors Hospital, Washington. — Intra-arterial transfusion has been found most effective in cases where the heart beat has stopped or has become almost imperceptible following a heavy loss of blood.

It is emphasized that this type of transfusion is not a substitute for intravenous transfusion except in cases in which the blood pressure is very low or in cardiac arrest from hemorrhage.

With blood pressure at zero and with no palpable pulse, circulation has been repeatedly restored in an unbelievably short time.

Intra-arterial transfusion may be done at the bedside or in the operating room, depending somewhat on the urgency.

The radial artery is usually exposed by incision at the wrist and the transfusion needle inserted. The femoral artery or the aorta also may be used.

The blood may be introduced by gravity through elevating the donor bottle five feet above the patient, or by applied pressure. In extreme cases, where a small quantity of blood has to be injected into the arterial system with the utmost speed, this is accomplished by drawing the blood from the bottle into a syringe and injecting it with pressure. The quantity of blood which may be introduced by artery is indeterminate, and must be adjusted for each patient, but hardly less than 500 cc. should be considered.

Obese Patient is Poor Operation Risk

Dr. Willard Bartlett, Jr., Assistant Professor of Clinical Surgery, St. Louis University.—The obese patient is a poor risk in major operations, and abdominal surgery should be deferred until a weight reduction can be effected. Exception is a case involving cancer or an emergency such as acute appendicitis.

The danger is that a weak scar—in which the deep, muscular layers have been separated, leaving only fat and skin intact—may produce a ventral hernia.

The regimen of weight reduction may last as long as six months. This diminishes the risk to life and assures

healing of the incision.

Fat persons needing hernia operations should reduce to a point where the edges of the muscle defect can be brought together under the skin by pressure of the hands while the patient lies on his back.

Every effort is made to persuade the patient that he is to learn new habits of eating rather than to undergo a brief forbearance from overindulgence in concentrated foods.

Decrease in Cervical Cancer Possible

Dr. George A. Hahn, Associate in Obstetrics and Gynecology, Jefferson Medical School, Philadelphia.—Good obstetrics, periodic pelvic examinations, the judicious use of cesarean section and the removal of diseased cervices will help reduce the incidence of cancer of the cervix.

Cervical cancer constitutes about 11 percent of all cancer and 55 to 65 percent of all cancers of the genital system. It occurs much less frequently in women who have not borne children. Nearly one-third of the cases occur in women 40 years of age or younger.

Complete hysterectomy in the treatment of benign or non-cancerous uterine conditions will eliminate the cervix as a potential site for cancer in later years. There is a net incidence of about 4 to 5 percent of cancer of the true cervical stump, left by a partial hysterectomy.

The treatment of cervical cancer to produce a cure is by means of surgery and irradiation, which should not be regarded as competitors in the treatment since each has a part to play.

Drug Implanted under Skin—Pain Reliever

Dr. Edward M. Tracy, Jr., Hamburg, N.Y.—Relief of pain in advanced cases of prostatic cancer by implantation of pellets of estradiol beneath the skin is reported.

Two reasons are given for the implantation technic. One is that patients are not faithful to their oral medication and the implanted pellets, which are slowly absorbed by the body, provide a dependable, unfailing means of administration. Secondly, oral use of the drug causes gastric distress in some cases.

We implant 50 milligrams of estradiol in the form of two pellets of 25 milligrams each, beneath the skin of the anterior thigh. No local evidence of an undesirable effect has been encountered.

The procedure is repeated every three months, in most cases the absorption being completed at that time.

The early response is often dramatic. The bone lesions disappear and four of the cases that were practically helpless returned to work. Three who were using heavy doses of morphine became free of pain without morphine. A few patients did not respond at all. Most, however, received considerable benefit and many who had been on oral estrogen and who had not readily yielded to treatment were rehabilitated. None of the cases developed any gastric disturbance, but in all mammary gland enlargement occurred which was painful in a few cases.

After the initial improvement, many of the patients began to go downgrade.

It is known that these measures are not curative, but they have resulted in relief of considerable suffering.

That Mole May Become Malignant

Dr. Albert D. Davis, Assistant Clinical Professor of Plastic Surgery, Stanford University School of Medicine, San Francisco.—Beware of the innocent-looking mole. Malignant melanomas may occur almost anywhere on the body surface and, while rarer than other types of malignancy, they are probably the more deadly.

In women during the child-bearing period a simple, flat, pigmented mole, usually congenital in origin and often on an extremity, may suddenly flare into a rapidly growing tumor.

Since melanomas of all types are resistant to radiation, surgical removal with a wide margin of normal skin and deep underlying tissues, even at the risk of causing deformity, is a necessity in these cases.

Subsequent gland dissection is to be advised and done either at the same time or within a very short period.

Fractured Disk May Cause Low Back Pain

Drs. Ralph D. Padula and Robert C. Keys, Orthopedic Surgeons, Stamford and South Norwalk, Conn.—Ruptured intervertebral disks are a common cause of chronic back and leg pain. In most cases, surgery offers permanent and often complete relief.

The symptoms do not always appear immediately. They consist of a sudden, one-sided, low-back pain followed by severe ache down one thigh to the calf, ankle or foot. There is tenderness and the patient usually walks with a stiff back.

Technic for Non-Healing Joint Fractures

Dr. John H. Moe, Assistant Clinical Professor of Orthopedic Surgery, University of Minnesota, Minneapolis.—The procedure combines traction with internal fixation of the fracture. The bone plate is put on through a lateral approach, eliminating the necessity of opening the hip joint.

In 25 patients below the age of 70 years, the results were satisfactory in 19 (76 percent). In 14 patients over the age of 70 years, the results were satisfactory in six (43 percent) cases.

After the operation, the patient is placed in a traction suspension for 10 days. He is then allowed to be up in a chair or on crutches. The procedure is not recommended for fresh fractures.

Intravenous Use of KCl Saves Lives

Drs. Hyman S. Lans, Irving F. Stein, Jr., and Karl A. Meyer, Cook County Hospital, Chicago.—Administration of KCl intravenously in many instances has been found to be a life-saving measure where the patient is suffering from potassium deficiency.

The normal daily intake of dietary potassium is about three or four grams. There is no storage of potassium in the normal adult; on the contrary, the excess is excreted in the urine. In malnutrition or dehydration, cell breakdown occurs, with resultant release of potassium from the cell. When vomiting or diarrhea is present, potassium is lost.

Hypopotassemia is detected by gradually increasing

weakness, loss of strength and energy, loss of appetite and mental depression. Weakness of the arms and legs is prominent. Abdominal distention is also frequently noted. The possibility of death from respiratory paralysis has been emphasized.

In 290 cases studied, administration of potassium chloride intravenously was followed with few exceptions by prompt and often striking improvement in muscular strength, mental attitude, energy, appetite and subsidence of abdominal distention. In many cases, the institution of this therapy was a life-saving procedure.

It is pointed out that, while the marked improvement was accompanied by an increase in the serum potassium concentration, it was not always necessary to restore the level to normal in order to obtain clinical improvement.

Most foods are a good source of potassium and intravenous feeding is unnecessary after the usual potassium level has been restored and the patient can be fed normally.

Radiology Useful in Obstruction of Bowel

Dr. Ira H. Lockwood, Director, Department of Radiology, Research Hospital and Clinic, Kansas City.—Intestinal obstruction is an absolute surgical and radiological emergency. Pain, distention and vomiting always indicate a scout roentgenogram of the abdomen.

When the examination indicates obstruction of the small bowel, the patient is operated upon immediately, unless so much distention is present or the physiology is altered to such an extent that surgery is not deemed wise. In this event, decompression must be carried out. Presumptive diagnosis of embarrassment of blood supply always means immediate surgery.

Faulty Posture May Cause Backache

Park Nicely, M.D., Chief of Urology, Acuff Clinic and St. Mary's Memorial Hospital, Knoxville, Tenn.—Correction of faulty posture often relieves a patient who believes his backache is the result of kidney trouble.

In some patients, the chief cause of chronic back pain is a relative shortening of one leg, usually congenital, but often the result of a fracture. If the patient stands most of the time, he will usually develop the habit of standing on the longer leg. If he walks a great deal, he will overdevelop certain muscles on the shorter side.

Other causes of backaches include infection or cancer of the prostate, urethral stricture as the result of infection or injury, and abscess or infection in or around the kidney.

Pain Relief Possible for All

Dr. Roland M. Klemme, Professor of Surgery, St. Louis University School of Medicine—There are several principal procedures that can be used to reduce or abolish intractable pain, depending on the site and extent of the painful stimulus as well as the tissues involved. Surgical removal of the painful part, as in peptic ulcers; cutting of nerves transmitting the painful impulses; cutting of the tracts within the central nervous system, and brain operations.

Many patients harassed by pain can be relieved early by surgery and the use of narcotics reduced noticeably or even completely avoided.

American College of Surgeons

Abstracts of some of the papers presented at the San Francisco meeting

Treatment of Experimental Hemorrhagic Shock

1st Lt. Arthur L. Gropper (M.C.) M.D., Everett Williford Cockrell, B.S. and Lt. Col. Edwin J. Pulaski (M.C.) M.D., Med. Sc. D., F.A.C.S. From the Surgical Research Unit, Brooke Army Hospital, Brooke Army Medical Center—In these experiments, dextran-treated dogs had a mortality of 22 per cent, oxypolygelatin 33 per cent. Both figures have wide statistical significance over the untreated dog mortality of 85 per cent. These substances are as efficient as dog plasma in assuring survival.

Blood pressure is restored more rapidly and to higher levels than comparable saline treatment.

Dextran gives greater and more prolonged expansion of blood volume than either dog plasma or oxypolygelatin. The blood pressure and blood volume restoration does not differ significantly in nonsurvivors.

Dextran restores glomerular filtration and renal blood flow more rapidly, to greater levels and for a longer period of time than oxypolygelatin.

At autopsy there are no abnormalities related to the infusion of either substance.

Dextran (6 per cent) exhibits twice the effect of withdrawing fluid from the interstitial compartment as does oxypolygelatin (5 per cent).

Hyaluronidase Prevents Adhesions

John E. Connolly, M.D., and Victor Richards, M.D., from the Surgical Research Laboratory, Stanford University School of Medicine, San Francisco.—In tests on dogs where the adhesions were merely freed and no hyaluronidase instilled, all the adhesions reformed. In dogs where 2 vials of hyaluronidase were used there were some reformed adhesions, but remarkable fewer than there were prior to the lysis and the addition of the hyaluronidase solution. In dogs where 4 vials of the enzyme were used, there were no adhesions.

The exact explanation of hyaluronidase's apparent action in preventing the reformation of intestinal adhesions is not known, but it is probably related to its power to antagonize hyaluronic acid which some investigators think is secreted by fibroblasts engaged in fibrous tissue formation. The amount of hyaluronidase used was

empirical and seemed to have a direct relationship to its success in preventing the reformation of freed adhesions. Another group of investigators was unsuccessful in obtaining beneficial results with hyaluronidase on abdominal adhesions, but they have used much smaller amounts of the enzyme.

The authors instilled hyaluronidase solution in the peritoneal cavities of 14 human patients following the freeing of intestinal adhesions which were causing intestinal obstruction. The first 12 cases have not to this date clinically obstructed. They have been followed from 3 to 14 months postoperatively.

The last two cases in which the enzyme solution was used became obstructed approximately 7 and 30 days postoperatively. At re-exploration, their adhesions had reformed. The authors empirically used 12 vials of hyaluronidase dissolved in 20 cc of isotonic saline in the same fashion as in dogs.

Because of the rather remarkable results obtained in animals and because the amount of enzyme used directly affected the number of adhesions, it is felt that the two clinical failures may be the result of using insufficient enzyme. The authors plan now to investigate further the relationship of quantity of enzyme and number of adhesions and speculate that 20-25 vials of 500 units each of hyaluronidase solution will probably be necessary to prevent the reformation of freed adhesions in the average size patient.

Present Status of Antibiotics

Edwin J. Pulaski, M.D., D. Sc., F.A.C.S., Lt. Col., Medical Corps, U.S. Army, Walter Reed Army Medical Center, Washington, D.C—Penicillin continues to be the drug of choice for all hemolytic streptococcal, pneumococcal, anthrax, spirochetal and actino-mycotic infections. It is the drug of choice for staphylococcal infections susceptible to its action; for others, aureomycin, chloromycetin or terramycin are used.

Aureomycin and terramycin are as effective as a combination of pencillin and streptomycin in the treatment of peritonitis and other mixed infections.

Streptomycin is still the agent of choice for several forms of tuberculosis.

Aureomycin, terramycin and chloromycetin are equally and promptly effective in the treatment of bacillary dysentery. Aureomycin and terramycin are effective and have the lowest relapse rates in the therapy of amebic colitis.

Post-Operative Thrombo-Embolism

William W. Coon, M.D.; and Robert M. Whitrock, M.D., Ann Arbor, Mich. From the Dept. of Surgery, University of Michigan Medical School—The ability of thrombin to clot fibrinogen decreases if it has first been mixed with plasma. It is postulated that more than one factor may be involved in this mechanism. Studies to delineate the characteristics and relative activity of each of these thrombin-inhibiting substances in plasma have been ham-

pered, however, by the failure to date to obtain any component of the clotting mechanism in chemically pure form.

Volkert has shown in animal studies that there are at least two fractions having thrombin-inhibiting properties. One fraction containing 80 percent of the total inhibiting properties is constant under all circumstances. The other component is variable, increasing many times in anaphylaxis, obstructive jaundice, and in the presence of certain "coagulative irritants;" he has shown that injection of heparin will produce a rise in antithrombin identical to that produced by this second fraction. In addition, in experimental intra-vascular clotting, either both fractions remain constant, or, under certain special conditions, the titre of the second fraction rises; he was never able to demonstrate a fall in antithrombin.

Seegers pointed out that all tests for antithrombin now available measure multiple factors and are influenced by a number of variables; (1) the influence of the substance in plasma which acts independently of heparin; "natural antithrombin," (2) the influence of heparin concentration, (3) the possible influence of heparin co-factor concentration, (4) the possible influence of a variety of unknown factors.

Responsible Factors

The factors responsible for varying test results cannot be determined with accuracy. It is the authors' impression from the results of their studies that clot formation in tubes containing lesser amounts of added thrombin is due to a minute increase in the concentration of thrombin in the patient's plasma. "Low" test levels have appeared to parallel in most instances the amount of tissue necrosis. Such increased tissue breakdown would theoretically increase the amounts of circulating lipoid thromboplastin and thus enhance the rate of conversion of prothrombin to thrombin.

Similarly, if Lyons' theory concerning the mechanism of conversion of fibrinogen to fibrin is correct, then increased amounts of circulating thrombin must be present in order to increase the amount of circulating fibrinogen B so that it may be detected by his test procedure. His theory would tend to substantiate our postulate that this test is also indicative of increased amounts of circulating thrombin and support the finding of some degree of parallelism between "low" Kay test levels and a positive test for fibrinogen B.

Data Analysis

The analysis of data obtained from multiple determinations on a large number of post-operative patients has brought out some further interesting facts. The increased capacity of plasma to clot in the presence of lesser amounts of added thrombin suggests, at least, that there is an increase in the ease of blood coagulability in the post-operative patient. This is much more common than had been suspected, since some increase occurs in the majority of post-operative patients. However, these studies are

unable to confirm that the Key Test of the Lyons Test is accurate in the prediction or diagnosis of thrombo-embolism.

In addition, in this preliminary analysis, the prophylactic regimen of alpha tocopherol-calcium gluconate medication does not appear to be efficient in changing the coagulability of the plasma from post-operative patients or in lowering substantially the incidence of thrombo-embolic complications. A comparable incidence of intravascular clotting has been found in control and medicated groups. The authors will, however, continue the treatment of alternate cases until a sufficient number is available to be of real statistical significance.

Psychiatric Risks Involved in Surgical Care

Lincoln D. Clark, M.D., Assistant in Psychiatry, Massachusetts General Hospital and Harvard Medical School—Most mental disturbances in surgical patients occur early in the post-operative period. The causative factors are variable. These are outlined as follows: (1) Abnormal reactions to the psychological meaning of the anesthesia or surgery. (2) Toxic psychoses secondary to the use of drugs. In this regard, the barbiturates and atropine are the most frequent offenders. (3) Toxic psychoses associated with metabolic disturbances. Dehydration, electrolyte imbalance, nitrogen retention, and nutritional defects may at all times produce abnormalities of cerebral function which may become manifest in the form of acute psychiatric illness. Toxic psychoses are generally characterized by the presence of variable degrees of confusion, disorientation, and abnormalities of the sensorium, particularly visual illusions and hallucinations. (4) Mental abnormalities secondary to hormonal therapy. Since the wider use of hormones in conjunction with surgery our collection of psychoses has increased.

Blood Volume Changes

Charles A. Hubay, M.D., Wm. E. Abbott, M.D., Arthur Abelson, M.D., Frank Cebul, M.D. and Robert J. Isant, M.D.; Dept. of Surgery, Western Reserve University School of Medicine—Modified globin solutions prepared from human erythrocytes can be administered safely to normal patients. Apparently globin solutions are capable of being considered plasma "extenders" although the effect is less pronounced and less predictable than plasma.

Following the intravenous administration of 500 ml. of human globin solution, in normal subjects, hemodilution seems to be progressive and becomes maximal at about 12 hours. Following the infusion of globin no alteration of red cell sedimentation rate was noted and the pseudo-agglutination phenomenon was absent.

In severe injuries, whole blood is the ideal fluid for therapy, but a satisfactory substitute may save lives in an emergency by supporting the circulation until such time as a transfusion can be administered. Modified globin should be considered as a plasma "extender."

Soft Part Aspects of Ankle Injuries

Harrison L. McLaughlin, M.D., F.A.C.S., New York, Professor of Clinical Orthopedic Surgery, Columbia University, College of Physicians and Surgeons—Every apparent sprain should be considered a ruptured ligament until proven otherwise. Broken ankle bones cannot become displaced except by virtue of damage to the supporting soft parts. In certain fractures these soft tissues uniformly become interposed between the broken pieces of bone so that replacement is difficult or impossible and bony union of the fracture is precluded from the start. These complications can be recognized by the conformation and location of the bony break and when recognized are easily manageable.

A fracture of one malleolus with displacement is certain evidence of damage to the opposite ligament (stirrup). Usually the ligament injury is potentially more serious than the fracture.

End-to-End Intestinal Anastomoses

N. Miles Fellows, M.D., Joe Burge, M.D., C. Stevan Hatch, M.D. and Philip B. Price, M.D., Dept. of Surgery, University of Utah School of Medicine—Sutured bowel holds with maximum strength immediately following the completion of anastomosis and with almost equal strength for a period of 24 to 48 hours. By the third postoperative day, there is a loss of holding strength of approximately 50 mm. of mercury. It is apparent that the holding strength of the sutures is of greatest importance during the first three postoperative days, and is of much less importance once fibroplasia begins.

Of interest is the observation that anastomoses did not pull apart when the sutures were placed superficially nor leak between the sutures when they were placed seven to eight mm. apart. Likewise anastomoses with sutures entirely through the bowel wall held quite satisfactorily as did those in which the sutures were tied very tightly, almost cutting through the bowel wall. These results indicate that accurate apposition of the ends of the bowel and perfect inversion of the mucous membrane are the two most important features features of an anastomosis.

Abnormalties of Nutrition and Their Correction

Frederick J. Stare, M.D., Boston, Harvard University, Associate in Medicine, Peter Bent Brigham Hospital—Surgical patients are likely to have increased energy and vitamin requirements. Concerning the latter, precise methods of evaluating the degree of deficiency are lacking but methods of generous correction are easily available. Energy needs may be greatly increased following operation and trauma and when this occurs in an individual who has lost appreciable weight and is unable to consume adequate quantities of food the caloric deficit may be considerable.

Fat emulsions that can be given by vein offer the greatest potential means of overcoming severe calorie deficits in surgical patients.

Question Box

Q. How long do needles in needle tubes plugged with cotton stay sterile?

A. Indefinitely. The use of paper caps (other than Kraft) over needle tubes is also a satisfactory technic except that they are time consuming to put into place.

Q. Is running a spore count on your sterilizer once a week a good idea?

A. It is a waste of time and money because the average bacteriologist does not know enough about sterilizers to get a good answer. Bacteria with a sub lethal dose of heat do not grow out in less than ten days of culturing. Twenty-one days is routine. Hospital laboratories report no growth in 96 hours as indicating sterility. Very few bacteriologists inspect sterilizers to make sure the culture comes from the bottom and not from the top. If a sterilizer is airbound, the bottom will be unsterile while the top may be sterile. Repeated inspection by a person who knows a sterilizer and proper operation by time and temperature provides the most safety for the patient. It does no good to run a test which does not get you an answer for three weeks after supplies are used.

Q. Can you use ordinary sewing cotton thread for surgery?

A. You cannot use cotton from commercial sources for surgery because it is dressed to withstand the traums of sewing. This is particularly true of cotton used in sewing machines. It is covered with a wax which is irritating to tissues, causes a foreign body reaction in tissues and results in extruding of sutures. It has to be soda boiled to remove the cotton wax. Dyed cottons are also unsatisfactory because of mordants added to make them color fast which are also irritating to human tissues.

Q. Can rubber gloves be laundered in the hospital laundry?

A. Not if the regular laundry detergents are used. The gloves will come out tacky and unfit for use.

Q. How often do you resterilize dry goods?

A. If they are properly packaged; properly wrapped and properly stored in a dry, vermin free place, they are sterile indefinitely and resterilizing is a gross waste of time, steam and material.

Capt. Collins

O. R. Nurse in Korea

By Ruth Boyer Scott, R.N.

"I BEGGED them to let me stay," Capt. Edna M. Collins, R.N., said at Walter Reed Army Hospital, in Washington. Other Army nurses have come back from Korea for recruitment assignments or because of illness, but she was the first nurse to be rotated home under the new rotation plan.

With eight years of Army nursing, she had completed six months in Taegu, Korea, when the rotation plan brought her home unwillingly. She has been assigned on duty status at the Army Medical Center hospital.

In her hospital in Korea, normally planned for 500 patients, they had from 1000 to 1200 patients. A Korean school held part of the overflow. "We moved in beds and carried on," Capt. Collins said.

Our hardest time was 14 terrific days in January," Miss Collins recalled, "when we worked 18, or 20, or 22 hours, with only 4 to 6 hours rest."

Her entire Korean service was in the operating room. This was an efficient use of her pre-Army experience when she worked with a civilian surgeon. Her school of nursing was Baptist Memorial in Memphis, Tenn., where she had sound preparation in operating room nursing.

"Our hospital in Korea was a pre-fab building," Miss Collins said. "Our partitions were thick net. You could

see from one end to the other. When we looked at patients waiting in the halls and the pre-operative room, we drew new strength."

The longest time she was on her feet was 24 hours—a couple of times when UN forces were pushed back in January and February. The hospital's five operating rooms had four general surgeons and five surgical nurses. Corpsmen worked with the nurses. In one rush period, a surgical team was sent from a hospital 20 miles away, which was having a lull.

Supplies were prepared on a 24 hour basis in a central supply room with five autoclaves. Sterile supplies were never short, although at times instruments had to be boiled, when time was lacking to autoclave them. Koreans were employed to help with supplies.

Patients were booked on the bulletin board, with the exact location of the foreign body, or the fracture designated from a reading of x-rays. In head cases, the x-rays were posted in the operating room.

"I remember having seven head cases in one 12 hour period, cared for by three doctors and two nurses," Miss Collins said. "All our operations were emergency ones. We did amputations for severe injuries, but in cases of frozen limbs we sent the patients along the evacuation route. We had a lot of neurosurgery, chest and abdominal wounds, debridement and orthopedic cases."

So successful was early operation in neurosurgical cases that the neurosurgery unit was moved from Tokyo. Because of its success in saving more lives, the plan was to move this unit nearer to the front lines.

"I find operating room nursing tremendously interesting," Miss Collins said. "The only lack is personal contact with patients. Under the emergency conditions, we couldn't know any patient personally. Since I've come home, several families have telephoned me to ask whether I knew their son. Unfortunately I didn't know any patients."

When their hospital had from 45 to 50 operations in 24 hours, they used a lot of blood. "I was scared at times that we would run out of blood, but we never did," Miss Collins said. "I've seen as many as 10 pints of blood used on one patient during the period when he was on the table. If he was in shock or bleeding internally, we put the blood in by both foot and arm simultaneously."

She did have some contact with ward nursing—by volunteering for ward duty on some of her Sundays off.

Army food in Korea sounded like earlier field food—with powdered eggs and dehydrated potatoes. "But we had plenty of what we had," Miss Collins said.

She is signed up till 1954, and says, "I told them this morning I'd go right back. Army nursing is a wonderful challenge to nurses."

St. Louis O.R. Nurses

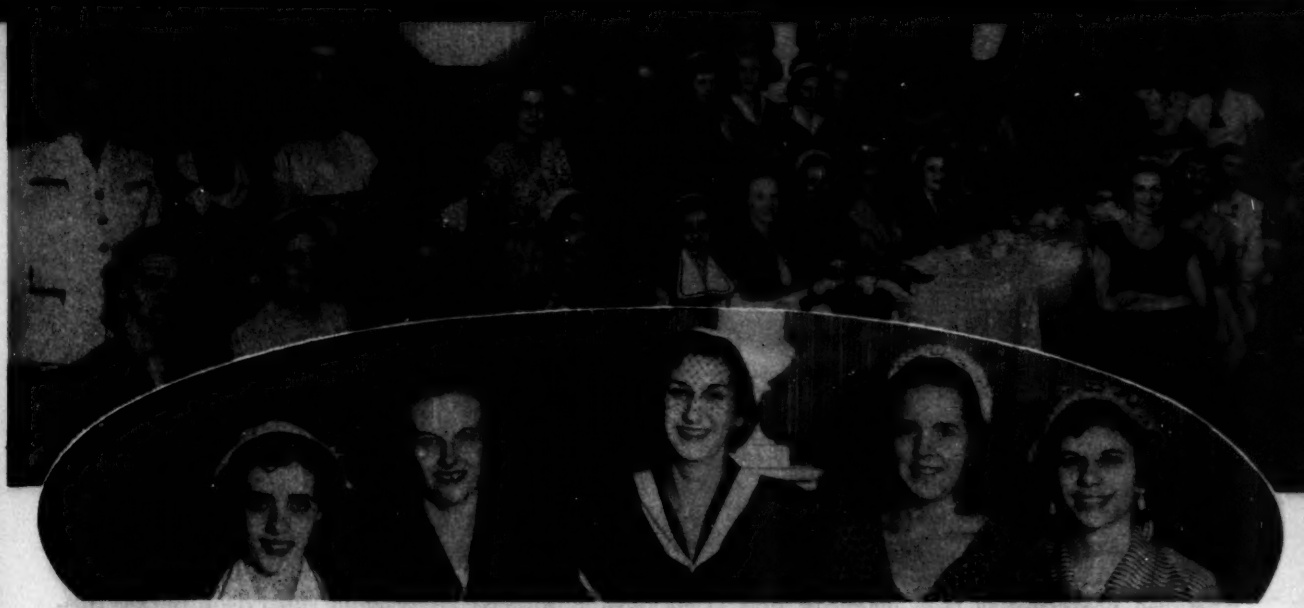
THE St. Louis Association of Operating Room Nurses held its first meeting at St. Louis City Hospital, St. Louis, on April 10, 1951. There were 50 nurses representing many of the St. Louis Hospitals. All were enthusiastic for the growth of this organization.

A committee was appointed by Doris Hohm, Chairman, to hold the meetings the second Tuesday of each month at St. Louis City Hospital.

RENO

MEMBERS OF THE NEW O. R. GROUP are shown above: From left to right they are: standing: Mary A. Ritchie, administrator, Carson Tahoe Hospital, Carson City; Helen F. Allison, O.R.S. also of Carson Tahoe Hospital; Frances Sheehan, O.R.S. and Maida J. Pringle, Supt., both of the Washoe Medical Center; and Grace Root, O.R.S., St. Mary's Hospital.

Seated are: Helen Patton, night O.R.S., Washoe Medical Center; Melba Kaminaka, assistant O.R.S., Veterans Hospital; Eva Young, O.R.S., Veterans Hospital; Eleanor Bryson, O.R.N., St. Mary's Hospital, and Agnes Pfiefer, assistant O.R.S., St. Mary's Hospital. Unable to attend was Sister Xavier, O.R.S., St. Mary's Hospital.



Pittsburgh O. R. Group Elects Officers

ABOVE are the members of the Operating Room Nurses Association of Pittsburgh. They met at the Royal York Dining Room for their June 12 meeting. The officers of the group are shown in the inset and are from left to right: Catherine Marburger, Presbyterian Hospital, president; Mrs. Eunice Rowse, Washington Hospital, board member; Catherine Fairley, Allegheny General Hospital, treasurer; Shirley Glass, Eye and Ear Hospital, secretary; Mrs. Mary Jane Flemming, Veterans Hospital, board member. Not present for the picture was Joan Kerr, Mercy Hospital who is the vice president.

RECEPTION HELD FOR ST. LOUIS O.R. GROUP

MEMBERS of the St. Louis Association of Operating Room Nurses were invited to an informal get-together at the Jefferson Hotel, St. Louis, by HOSPITAL TOPICS, during the A.H.A. Convention. The Group, which organized last April 10, will hold its first fall meeting the second Tuesday of October. An interesting and detailed program has been planned. Miss Doris Hohm, O.R.S., City Hospital, is president of the Association.

Shown at right are: Dr. E. W. Blotter, Medical Officer in charge of U.S.P.H.S. Hospital, Chicago; Lois Rea, O.R. Nurse, City Hospital, St. Louis; Doris Hohm, O.R.S., City Hospital, St. Louis; Mrs. Blotter; Lou Garnett, Head Nurse, City Hospital, St. Louis; Jack Steinle, Hospital Program Director, U.S.P.H.S., New York City, and friend. Inset: Evelyn Davis, head nurse, O.R., Barnes Hospital, and Doris Woods, teaching supervisor, Barnes Hospital, chat with Capt. Thomas Cooper, Commanding Officer, U.S. Naval Hospital, Chicago, and Mrs. Verna Wilson, O.R. Supervisor, Barnes Hospital.

West Virginia O. R. Group Elects Officers

THE West Virginia chapter of the Association of Operating Room Nurses met in Huntington June 22. The chapter which was formed last year (see TOPICS, Dec., 1950) is seeking to expand its membership.

Officers elected for the 1951-52 term are: President, Mrs. Vianna Fray, ORS, Huntington State Hospital; Vice President and program chairman, Norma Young, ORS, Kanawha Valley Hospital; Secretary, Evelyn Corkrean, ORS, McMillan Hospital, Charleston and Treasurer, Mrs. Mary Ruth Huffman.

Speaker of the evening was Dr. M. G. Burdette, a Naval Surgeon on recruiting duty in Huntington. He spoke on Trans-Orbital Lobotomy.

A highlight of the evening was a tour of St. Mary's Hospital's new 10 room operating suite which embodies the latest and finest in construction and equipment.

Vianna H. Fray, R.N.
President

Norma Young, R.N.
Vice President

Columbus Area Forms O. R. Group

First photograph of the Columbus group shows from l. to r., first row: Marilyn Smith, White Cross Hospital; Jane Bray, Fayette County Memorial Hospital; Washington Court House: Helen Dorsey, Newark Hospital, Newark; Irene Preston, also of Newark Hospital; Alice S. Ollie, St. Anthony Hospital; Aldyth Meyer, and Virginia Blair, both of Jane M. Case Hospital, Delaware; and Ruth Eppley, Bethesda Hospital, Zanesville. Second row: Doris Becker, Fayette County Memorial Hospital; Washington Court House: Kathryn Baker, White Cross Hospital; Remelda Allen, University Hospital; Helen Boecher, Chillicothe Hospital, Chillicothe; Joan Puriton, Mt. Carmel Hospital; Maxine Olive and Margery C. Davies, both of Mansfield People's Hospital, Mansfield. Third row: Sarah Timms, University Hospital; Gladys Jones, Good Samaritan Hospital, Zanesville; Ellen Zartman, Lancaster Fairfield Hospital, Lancaster; Janice Balmer, Grant Hospital; Dr. Charles Lovingood, guest speaker; Frances Ory, University Hospital; Velma Smithe, Lancaster Fairfield Hospital, Lancaster; and Louzana Gibson, Bethesda Hospital, Zanesville. Members who are not shown are: Joan Reed, Mt. Carmel Hospital and Louise Meeder, Children's Hospital.

Members of the San Diego group are shown below. Officers of the organization are shown above from left to right: Melba Anderson, U.S. Naval Hospital, secretary; Mrs. Harriett Draper, president and Mrs. A. Johnson, Mercy Hospital, vice president.

San Diego Operating Room Nurses Organize

THE great variance of procedures in operating rooms was the stimulus for organization of the San Diego O.R. Group. The nurses wanted an opportunity to discuss common problems and learn how other nurses were meeting them.

The Group formally organized in July and elected officers. Meeting the last Thursday of each month, they see that each meeting is of a beneficial nature and not a social affair. Several meetings have been on student curriculum and round table discussions, on teaching problems.

Program requests for future meetings submitted by nurses attending, included: orientation for the new RN, orientation for other workers, sterilization methods, new developments in supplies and equipment and additional student teaching programs.

Growth of O.R.S. Groups from Coast to Coast

This Map Shows the Rapid Expansion of Operating Room Supervisor Groups Throughout the Country

Index to 1950 O.R. Yearbook

Dangers in Surgical Suite Air Conditioning
R. A. Phelps 4
Talcum As An Operating Room Hazard 9
What an O.R. Nurse Should Know About Intra Arterial Transfusions
Albert E. Robert, M.D. 18
Medico-Legal Problems and the O.R.S.
William F. Martin 21
Use of the Septic Cart 32
How to Keep Ampules Submerged 35
Operating Room Problems and Suggested Solutions
Marian L. Fox, R.N. 36
How to Prepare a Spinal Set for Instant O.R. Use 41
The Starch Sponge 42
The Surgical Armboard
Lucille M. McDonald 45
New Safety Code 47
Anesthesia Hazards in Operating Room Can Be Reduced
Irving Wilson Voorhees, M.D. 55
What's New In Anesthesia
Dr. Henry K. Beecher 58
New Blood Transfusion Technic 62
Plastic—A New Approach to Surgical Drapes 65
An Illustrated Card File for the O.R.
Delpha M. Inman, R.N. 68
Ultraviolet Installation in the Operating Room 72
Care and Sterilization Technics of Surgical Instruments 75
Packaging the Laparotomy Kit 80
Cutting Instruments 86
Television in the O.R. 89
Question Box 90
The O.R. Library 92
By-Laws of the Dallas Assn. of O.R. Nurses 98
San Francisco O.R. Group 102
Houston 103
Chicago 104
Massachusetts 106
Tidewater 107
Shreveport 108
Grand Rapids 109
West Virginia 109
Twin Cities 110
New Jersey 114
New Orleans 116
Philadelphia 117
Oakland 118
North Carolina 120
Notes on Dr. Cairn's Talk to Lone Star State Operating Room Supervisors 128

THE

O.

A REGULAR MONTHLY FEATURE OF HOSPITAL TOPICS

R.

SECTION

Second Printing May 1952